FAMILIAR TREES

WITH COLOURED PLATES
& ILLUSTRATIONS FROM PHOTOGRAPHS

FAMILIAR TREES

HORSE-CHESTNUT

FAMILIAR TREES

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WITH

COLOURED PLATES BY
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AND

PLAIN PLATES FROM PHOTOGRAPHS AND
MICRO-PHOTOGRAPHS

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PREFACE.

TREES are universal favourites. Their exhilarating verdure in spring, their grateful shade in summer, their gay variety in autumn, and even the delicate tracery of their branching when exposed, leafless, in winter, endear them not only to the artist and the poet, but to us all. Their many associations have interests that appeal to the historian and the moralist, to the student of literature and of folk-lore, but little less than to those interested in botany. As Robert Boyle wisely said, "Naught can be beneath the notice of man that it was not beneath the dignity of the Deity to create"; so that if we have a real admiration for trees we shall not grudge the pains needful at least to recognise their differing kinds. The time has gone by when we could be content to stand agape at the wonders and beauties of the world of Nature: we require now some attempt, at least, at an analysis of the origin, purpose and significance of the objects of our admiration. Knowledge, and not ignorance, is the true parent of wonder.

In my endeavour to describe the beauties of our familiar trees, I must here acknowledge my indebtedness to many writers whose works I have laid under contribution, but more especially to the artists, the results of whose labours form the main attraction of this book, to Messrs. W. H. J. Boot, R.B.A., and A. Fairfax Muckley, who have painted the originals of the coloured plates; to Messrs. J. A. Weale and F. W. Saxby, who have made and photographed the microscopic sections of woods and pine-needles; and to Messrs. F. Mason Good, H. Irving, and E. J. Wallis, from whose photographs the uncoloured plates of trees are taken.

G. S. BOULGER.

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INTRODUCTION.

TREES are defined as perennial plants with a principal stem of some considerable diameter, rising from the ground and forming wood. Their woodiness distinguishes them from all herbs, and their one principal stem from shrubs.

Like all other highly-organised green plants, trees grow by means of food derived from the air by their leaves and from the soil by their rootlets. For this reason it is advantageous for the tree to expose as large a leaf-surface as possible to light and air; and thus we find not only its stem in most cases repeatedly branched, but also its leaves so disposed as to overlap each other to the least possible extent. The multitude of rootlets have some power of dissolving saline substances in the soil, and these they absorb, with an abundance of water, as an extremely dilute solution. By a combination of a force-pump action in the roots and suction exerted by the constant evaporation of water through the leaves, this watery fluid rises rapidly to the topmost leaf of the tallest tree, and in the cells of the leaves—the laboratories of the plant—it combines with the carbonaceous matter taken in from the air. In obtaining nitrogen from

the soil many trees seem to be materially assisted by the presence of the "spawn" or *myce'lium* of fungi, a mass of delicate threads investing their roots, known technically as a *mycorrhi'za*. Ruskin in his "Modern Painters" emphasises the dependence of tree-growth upon the leaves, pointing out that the size of every twig or branch is directly proportional to the leaves that it bears.

The main physiological function of wood is the mechanical one of giving strength to the stem, to enable it to resist its own increasing weight as it grows in height and branches.

The highest sub-kingdom of the plant world, the seed-bearing or flowering plants, the *Spermatophy'ta* or *Phanerogam'ia* of botanists, among which only is wood for all practical purposes produced, is subdivided into: (1) the *Gymnosperm'œ*, or plants the seeds of which are naked, *i.e.* not enclosed in a fruit; and (2) the *Angiosperm'œ*, or fruit-bearing plants. Of these, the Gymnosperms are all perennial trees and shrubs, their only representatives in the Northern Hemisphere being the Natural Order *Conif'erœ*, so named from the general arrangement of its seeds on a series of overlapping scales arranged in a cone. The members of this Order, which includes the Pines, Firs, Cedars, etc., produce numerous narrow, rigid, undivided leaves, whence they get the familiar name of *needle-leaved trees:* they have much-branched stems; and their wood is of rapid growth, soft and of even texture, formed in annual rings of growth, and generally resinous. They are, therefore, often spoken of as "soft woods" or as "resinous woods,"

though the former epithet is equally applicable to Willow, Poplar, or Horse-chestnut, whilst the Yew is destitute of resin, and does not bear cones.

The Angiosperms, the higher division of seed-bearing plants, are divided into two Classes, the *Monocotyle'dons* and the *Dicotyle'dons*, which agree in little except in having their seeds enclosed in fruits. The Monocotyledons, named from the seed producing but one primary leaf, or *cotyle'don*, comprise Lilies, Orchids, Palms, and Grasses, few of which, and those only tropical forms, such as Palms, reach the dimensions of trees.

Dicotyledons, so named from having two seed-leaves to the embryonic plant, comprise an immense and varied assemblage of plants, most of which are herbs, never, that is, forming wood. In those perennial members of the Class, however, which acquire the dimensions of trees, the stem generally branches freely, has a separable "bark," and increases in girth with age; the wood, though it differs in several important characters from that of Conifers, agreeing with it in being arranged in annual rings. These rings, as they appear in a cross-section of a tree, or conically tapering sheaths surrounding the tree, as they in fact are, form on the outside of the wood of previous seasons and beneath the bark; and this type of stem, characteristic of Gymnosperms and Dicotyledons, *i.e.* of all our familiar trees, is in consequence termed *exog'enous*, from the Greek *ex*, outside of, and *genna'o*, I produce. Dicotyledons are commonly slower of growth than Conifers, and their wood, especially that near the centre of the stem,

is often much harder. They are, therefore, known familiarly as *hard woods*, or, since they as a rule bear broad, net-veined leaves, as *broad-leaved trees*.

Though many trees multiply themselves by means of suckers, every species in its native country, when it has reached maturity, produces seed. The age of the tree at its first fruiting varies within wide limits: the seeds differ markedly from one another, as, for example, the large polished "chestnut" of the Horse-chestnut and the small rough kernel of the Cherry; and the seedlings which result from their sprouting bear seed-leaves or cotyledons which are commonly very unlike the leaves of the mature tree. Thus the strap-shaped cotyledons of the Sycamore bear no resemblance to the broad five-pointed leaves which the tree produces at a later stage.

Every stem and every branch, so long as it remains capable of elongation, ends in a bud. A bud is a growing-point protected by over-lapping rudimentary leaves; but the buds of different kinds of trees vary in position, in form, and in constitution. Those of the Ash, for example, are in opposite pairs, while the long tapering brown buds of the Beech spring singly at an angle from the twig, and the shorter and blunter ones of the Hornbeam are pressed against the shoot from which they spring.

During the so-called leafless season of winter, we may distinguish the various species of trees not only by the characters of their buds, but also by the bark of the stem and the form and

arrangement of the branches. The firm, ash-grey rind of the Beech is easily recognised as differing from the silvery flaking bark of the Birch; and the three kinds of Cedar in our parks, that of Mount Lebanon, that of Mount Atlas and the Deodar, are discriminated by the respectively horizontal, ascending, and drooping direction of their branches.

With the coming of spring the buds unfold, revealing an almost infinite variety in the arrangement, folding, and form of the leaves. It is important also to notice whether a leaf has at the base of its stalk the pair of more or less leaf-like appendages known as "stipules," conspicuous in Roses and Willows, or whether these fall off at an early stage, as in Oaks and Lindens, or are altogether absent. The arrangement of the so-called "ribs" or "veins," which make up the skeleton of the leaf and conduct the liquid food of the plant, is also noteworthy.

Our truly British forest trees all have comparatively inconspicuous greenish blossoms, so that many people are unaware of the fact that they have flowers at all. The pollen in this case is carried from tree to tree by wind, and not by insects: no honey is, as a rule, secreted in the flower; and in some cases, such as the Hazel and the Oak, the flower-groups or catkins are produced early, before the leaves are expanded, so that this action of the wind is unimpeded. The smaller trees of more open ground, and many of our familiar but not truly indigenous species, such as Thorns and Cherries on the one hand, and Laburnum and Horse-chestnut on

the other, have conspicuous white or coloured blossoms, often secreting honey, and otherwise adapted to attract insects, by whose agency their pollen is conveyed from flower to flower.

With autumn other features present themselves to our notice. The leaves assume various tints before they fall, and the flowers are succeeded by the fruit. The more or less crescent-shaped scars left by the fallen leaves, and the ring-like traces of the bud-scales often to be seen crowded together on the twigs at the lowest point of each season's growth, should be compared in different species of tree.

The fruits of most of our forest trees are dry and nut-like; but it needs but little observation to distinguish the nut of the Hazel from that of the Beech, or the fleshy and slightly spinous fruit of the Horse-chestnut from the densely spinous husk surrounding the nut of the totally dissimilar Spanish or Sweet-chestnut. Some of these nut-like fruits are furnished with wing-like structures, as in the Elms and Maples, by means of which the seed is carried beyond the overshadowing of the parent tree; but the fleshy and often conspicuously coloured fruits are special adaptations to attract birds or other animals, by whose agency the indigestible seed is even more effectively dispersed. Among seeds we find a similar variety of structures to aid dispersal—wings in Pine, parachute-like plumes of hairs in Willows and Poplars, and a gay-coloured fleshy covering in the Yew and the Spindle-tree.

In the botanical synopsis that accompanies the present work the trees described are arranged

according to what is known as the Natural System, an endeavour to group plants according to such external characters as those which we have here briefly indicated. There is another set of less obvious distinctive features which we are able to illustrate fully for the first time: the microscopic structure of the woods of the different species. The transverse sections here represented—sections, that is, cut at right angles to the grain and axis of growth of the woods—have been cut so thin as to be transparent, and have been magnified ten or, in most cases, thirty diameters. Each photomicrograph here reproduced has been taken from a section of wood five-eighths of an inch square; but, as "thirty diameters" means that any linear dimension of the object is enlarged thirty times, it is obvious that by no means the whole of these small square sections can be included on one of our pages. A casual glance at this remarkable series of illustrations will show that, with considerable uniformity, they present also much individual variation.

The woods of all our familiar trees, growing as they do in a land subject to marked seasonal change, exhibit annual rings of growth. From the number, width, and concentric regularity of these rings we may read not only the age of stem or branch in years, but also something of the climatic fluctuations of those years, and something as to the surroundings of the tree. The newer, outer rings often differ markedly in colour from the older ones nearer the centre; and, with this difference in colour, there is generally a difference in strength and durability.

The *heartwood*, as it is called, of the Laburnum, for instance, is so dark as to be known to the French as Green Ebony, whilst the outer or *sapwood* is light yellow. In the Locust dark heartwood makes its appearance in a five-year-old shoot, so that the sapwood is always a narrow outer band: in other trees, such as the Elms, the sapwood is wide, and in others, again, such as the Maple, there is little or no distinction of colour between the two regions.

In each annual ring there is often a well-marked difference between the wood formed in spring and the later, summer or autumn wood. In a piece of Oak, for example, we can see with the naked eye that the inner part of each ring is crowded with relatively large holes, or "pores," as they are termed; but the wood formed later in the season shows few or none of them, though far smaller ones can be detected with a lens.

In Pines, and most other coniferous trees, these pores are absent, though a few similar large holes appear scattered over the section of the rings. These will prove, on examination, to be sections of large ducts containing resin, whilst the pores of the wood of broad-leaved trees are water-conducting vessels.

Apart from other characters, these pores give us a basis for a threefold classification of woods, into *non-porous*, which is practically equivalent to coniferous; *ring-porous*, as in Oak, Chestnut, Elm, etc., where the large pores in the spring wood define the inner margin of each ring; and *diffuse-porous*, where the pores are usually small and are scattered evenly throughout the annual ring.

HORSE-CHESTNUT LEAF, FLOWER AND FRUIT.

THE HORSE-CHESTNUT.

Æs'culus Hippocas'tanum L.

So hardy, so commonly planted, so well known, and withal so beautiful a tree as the Horse-chestnut, though certainly not indigenous, claims early notice in these pages. The land of its nativity is unknown. This has been variously stated as Thessaly and as Thibet; and its introduction into this country is said to date from the year 1550, but may not have been till eighty years later. It is planted, mainly for ornament, throughout Europe, preferring a loam sandy rather than stiff, in which it will make rapid growth.

The smooth and almost cylindrical bole which it forms seldom exceeds twelve feet in girth, and is generally green on its surface from the Algæ that invariably frequent the tree. The lowest branches are given off at from five to ten feet from the ground, and are the longest, so that, though always rounded above, the tree has, on the whole, a pyramidal outline. Starting in opposite pairs, like the leaves, the boughs, rising at an angle of 60 or 70 degrees from the stem, bend in a graceful curve outwards and downwards almost at a right angle to their first direction, so as again to make an inclination of 60 or 70 degrees from the upper part of the stem. They turn up at their points, thus describing in their entire course of growth a complex curve of unique beauty, which it is impossible adequately to describe in words. The whole

tree is not often more than fifty or sixty feet high, and seldom seems to attain an age of more than from two hundred to two hundred and fifty years.

Towards the end of March the boughs attract attention by the swelling of their large buds, that are at this season well enclosed in a series of opposite scales, of which the outermost are hard and of a dark chocolate colour. They continue to enlarge, and the glutinous cement that has protected them during winter now liquefies into a gum, or slime, that covers the eight or ten deciduous scales. Two by two these open outwards and fall off, until, in April, first one pair and then another pair of the delicate green leaflets make their appearance. The pale buff inner bud-scales, delicately fringed at their edges, at the bleak, leafless period of the end of March, render the tree attractive, suggesting a candelabrum of unlighted waxen tapers; but

> "When drooping chestnut buds began
> To spread into the perfect fan,"

they must have often seemed to many people as tongues of brilliant green flame, the vividness of their verdure, as seen scattered over the unclothed boughs, and illumined by the fitful gleams of an April sun, being excelled by none of the varied shades of green displayed by nature in that season of new-born youth. The leaves are composed of seven leaflets arranged in a radiating "digitate" or "palmate" manner, and each of a peculiar outline, broad at the outer end and tapering towards the point of their insertion on their common leaf-stalk—a form known technically as "obovate-cuneate." At first these leaflets are downy

and drooping; but, contrary to the general rule, their under surfaces grow faster than the upper, so that they rise and spread out horizontally, ultimately becoming very large, single leaflets sometimes reaching a foot in length, and the whole group being nearly two feet across, whilst the leaf-stalk becomes nearly a foot long and half an inch in diameter.

The glories of spring are but fleeting. By the time the leaves have stretched themselves to their full size, they have lost their beauty of colour, and the tree, when not in flower, having no gloss to the surface of the foliage, and being densely covered in, so that no bough is visible, is a dull brownish-green mass in the landscape, destitute of light and shade. In May, however, ere this dulling is effected, a new beauty is displayed, that of blossom. Then it may truly be said, in the words of the authors of the "Forest Minstrel," that the Chestnut is—

> "Glorious array'd;
> For in its honour prodigal nature weaves
> A princely vestment, and profusely showers
> O'er its green masses of broad palmy leaves
> Ten thousand waxen pyramidal flowers;
> And gay and gracefully its head it heaves
> Into the air, and monarch-like it towers,
> Dimming all other trees."

Then the larger green pyramid becomes but a background to set off the beauty of the lesser pyramids of snowy white, lined with gold, and just dashed with rosy red, whose beauty, when viewed from a distance, is only excelled by their perfection when closely scrutinised. We have in England so few trees with conspicuous blossoms that we are the more impressed

by the colour of Laburnum and Horse-chestnut; but there is undeniably something very majestic in the tapering form of these white clusters scattered so lavishly over the green foliage. Each "thyrse," as they are technically termed, from the triumphal sceptre, or "thyrsus," of Bacchus, is borne on a stout stalk, the branches of which are given off in a somewhat complex manner, forming a series of one of those spiral "cymes" that puzzle the student of structural botany. The flowers nearest the stalk on the lower branchlets are the first to open, and, receiving the full benefit of the nutriment prepared in the young and vigorous leaves, develop both stamens and pistils, so that they will be still represented amid the storms of the autumn equinox by the well-known globular fruits. The upper part of the thyrse bears flowers which are generally exclusively staminate, or male, and disappear after the discharge of their pollen; so that, eight, six, or more commonly but two or three, fruits will in autumn be the sole result of all the beauty of an entire pyramid of blossoms. Thus the number of fruits in a cluster affords a gauge of the geniality of the preceding May.

Few trees, in fact, afford more palpable lessons in practical physiology than the Horse-chestnut. We may watch the brown leathery rind of its seed swell with moisture before the primary rootlet forces its way out, and we may see the melting of the gum over the buds and the shedding of their protecting scales. The arrangement of the leaves determines that of the branches, and the flowers at the end of a shoot prevent its further elongation: the leaflets rise from the

vertical position, in which they offer but little surface to the chilling effects of radiation, by the more rapid growth of their under-surfaces: their enlargement is an exemplification of the marvellous elasticity of the substance of their cells; and their large spreading surfaces, when mature, taking in abundant carbon-dioxide from the air, and, by the transpiration from their "stomates," or leaf-pores, drawing abundant supplies of water from the roots, seem obviously related to the rapid growth of the soft and spongy wood. In the flowers we see the dependence of sex on nutrition, and in the fruit the economy of nature leading to a reduction in the number of seeds, since a large perennial plant has many more chances of perpetuating its species than an annual.

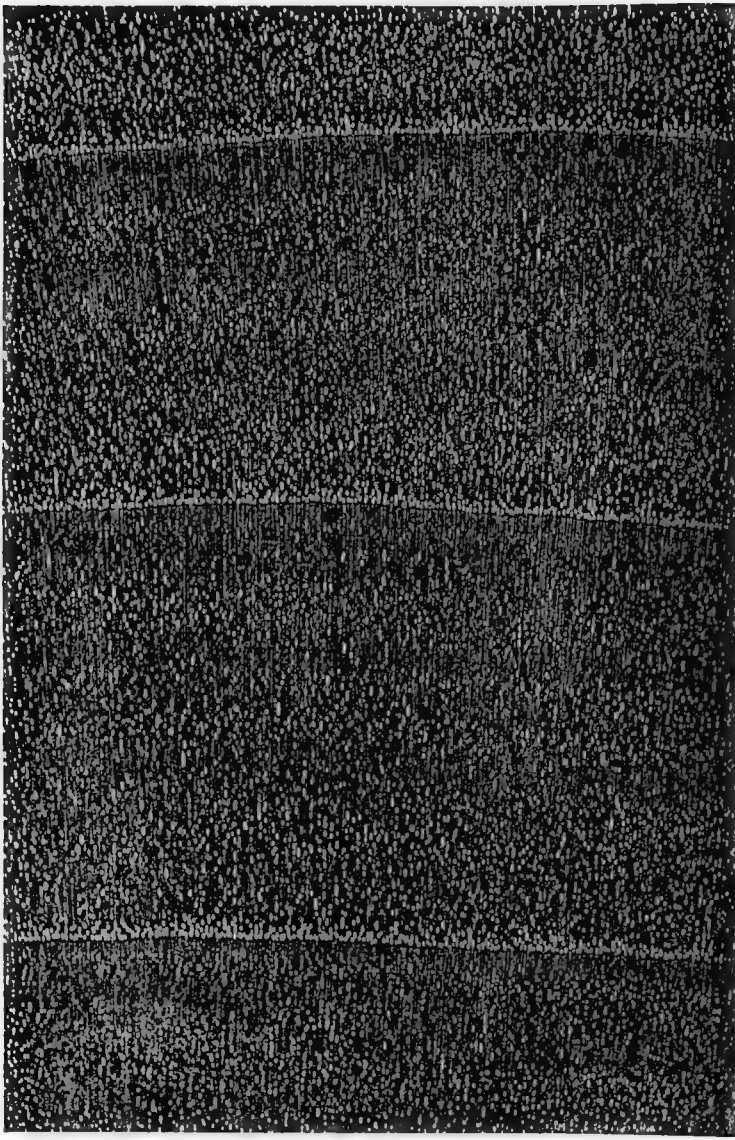
Returning to a closer examination of the flower, within its five green sepals we find five beautifully crimped or crisp petals, resembling those of the rose in texture, bent over so as to give the whole flower a somewhat one-sided appearance, making, in fact, its corolla vertical, while it is itself nearly horizontal. On each snowy petal are the splashes of pink and lines of yellow, that guide the joyous bees to the copious honey secreted in the bottom of the purely tinted cup. To the Linnæan botanist the tree is exceptional in having seven stamens, four, five, or ten being far more common numbers; and in the centre of the flower, beneath the single style, is the three-chambered ovary, each chamber containing the rudiments of two seeds.

In October the leaves, which have become dull—clogged with leaf-green, and with various saline and other excrementitious matters, substances not wanted

in the many chemical processes of plant-life which have been carried on in the laboratory of the tree's body—begin to get clearer in colour. The change varies in date and order. As Mr. Ruskin has truly said, "A group of trees changes the colour of its leafage from week to week, and its position from day to day; it is sometimes languid with heat, and sometimes heavy with rain." If the weather be fine, the leaves will generally turn to a lemon-yellow along the margins of their leaflets, while the midrib, and some of the other veins, remain edged with a band of green, clearer, paler, and more beautiful than any that the tree has borne during the three preceding months. If, however, the weather be wet, the delicate yellow is blurred with rusty stains, or the whole leaf becomes, before falling from the tree, of a rich ferruginous brown. Then, as separate leaflets, or the great fans in their entirety, come tumbling down in the gale, every now and then a rush is heard through the boughs, and a green or brownish prickle studded sphere falls to earth, often bursting with the shock, and disclosing the polished and mottled mahogany-like chestnut within.

Many of the fruits are thus blown down when green, fleshy, and unripe, and often they do not burst, but simply decay; or, if they are broken, they show immature seeds of an ivory whiteness, instead of the harder brown ones that lie loose within the chambers of the drier, riper fruits. Then the ground, strewn with leaves, green, yellow, or brown, with green capsules, some displaying the pure white inner surfaces, and with the bright glossy chestnuts still bearing a white scar marking their former point of attachment,

HORSE-CHESTNUT.



TRANSVERSE SECTION OF HORSE-CHESTNUT WOOD (X 10 DIAMETERS).

though it may not be tidy in the eyes of the gardener, is in those of the student of beauty a fresh debt that he owes to the Horse-chestnut.

Of the six ovules, we seldom find that more than three have reached the maturity of seedhood, and of these three—and there are sometimes not three—no two will be alike in size or marking. It is perhaps hardly necessary to allude by way of caution to the merely superficial resemblance between the seeds of the Horse-chestnut and the fruits of the Spanish Chestnut, their internal structure being, of course, wholly dissimilar. There is, at all events, but little fear that anyone will confuse the taste of the bitter kernel of the former with the favourite nut of the south. It is probably in opprobrium that it is termed the Horse-chestnut, as we have Horse-mint, Horse-daisy, Dog-violet, or Dog-rose.

The so-called uses of the Horse-chestnut are few; but we must not demand too much mere commonplace utility from a plant that gives us so much that is more valuable to our souls. Its wood is soft, and though suitable for gunpowder-charcoal, of but little use as timber. Deer are fond of eating the fallen leaves and nuts; and, when crushed, they have been added to the food of sheep, cows, and poultry, and have been used in bleaching and in the manufacture of starch. The name has been said to be derived from the use of the seeds for the relief of cough in horses, and more fancifully from the large horse-shoe-like scar left by the falling leaves, the ends of the "fibro-vascular bundles," or chief veins, being marked by seven nail-like imprints.

But, as has been said, it is for its beauty that we plant the Horse-chestnut. The variegated variety is not an improvement, and though the somewhat hot looking species with red flowers may be effectively grouped with the common form, it seldom flourishes so well, and is certainly not as beautiful as its white-flowered ally. The outline of the Horse-chestnut is so regular and so massive that it is less pleasing as an isolated tree than when projecting from the front of a belt of other species, grouped in a clump either with several of its own kind or otherwise; or, best of all, when it forms a noble avenue, such as that dear to Londoners in Bushy Park.

Since it does not, like the Elm, throw out great horizontal limbs to meet its neighbours and form a leafy arcade, such an avenue should in breadth be, if possible, at least 120 feet, or twice the height of the trees, that they may cast their shadows on the open space, and, when in flower, reveal a noble vista of verdure flecked with white clusters of blossom.

LABURNUM.

THE LABURNUM.

Cy'tisus Labur'num L.

THE great family *Legumino'sæ*, named from the pod or legume, which is, almost without exception, the fruit characteristic of every member of the group, is the second in point of number of species among the Natural Orders of flowering plants, and perhaps second also in the value to man of its various products. It comprises some seven thousand species, and pulse and fodder, timber, gums and dyes are yielded by its members in great variety. With the exception of Furze and Broom, truly British representatives of the Order seldom form wood: clovers and vetches constitute the majority of their number; whilst the Rosewoods, Logwood, and other large trees are mainly natives of the Tropics.

With the exception of the Judas-tree (*Cer'cis Siliquas'trum* L.) and the Locust or St. John's-Bread (*Cerato'nia Sil'iqua* L.), all the European members of the Order belong to the Sub-order *Papiliona'ceæ*, named from the Latin *papil'io*, a butterfly, from the supposed resemblance of their pea-like blossoms to a butterfly. With the greatest variety of size and colour, they all possess flowers of a singularly uniform structural type. Of five sepals, the odd one is placed in the front of the flower, *i.e.* on the side farthest from the stem whence the flower-stalk springs. Of five petals, which alternate with these sepals, the odd or

"posterior" one is generally larger, overlapping the edges of two others, and in such an erect position as to be termed the "standard" or *vexil'lum;* the two lateral ones, thus overlapped, are termed the "wings" or *alæ,* and in turn overlap the edges of the remaining "anterior" two, which are more or less united into a boat-like structure, and are, therefore, termed the "keel" or *cari'na.* There are always ten stamens, which are generally either all united into a tube, or nine of them are so, while the upper or posterior one is not. Lastly, there is a single carpel forming the usually many-seeded pod or "legume," which is often laterally compressed and so contributes to a general two-sidedness or bilateral symmetry in the flower.

Two trees belonging to this Sub-order, neither truly indigenous, are sufficiently familiar to be included in our list: one, the Laburnum, being European; the other, the so-called Acacia, North American.

The Laburnum (*Cytisus Laburnum* L.) is a native of mountainous woods in Central Europe. It has long been cultivated for the beauty of its blossoms throughout Europe; but no record exists as to the date of its introduction into Britain. Pliny's description of it, if indeed it does refer to this tree, hardly seems to be based upon personal knowledge. It is, he says, "averse to water, a native of the Alps, and far from generally known: the wood is hard and white, and the flowers, which are a cubit in length, no bee will ever touch."

Though it grows freely from seed and is not particular as to soil, the Laburnum does not occur as

an escape from cultivation, nor has it done anything to establish itself as in any degree naturalised. This may be in part explained by the fact that, though poisonous to cattle, its bark, and perhaps its seedlings, are greedily eaten by hares and rabbits.

It may safely be said that the true etymology of the name *Laburnum* is lost, for that suggested by the late Dr. Prior seems far too fanciful. It is, he suggested, "an adjective from the Latin *labor*, denoting what belongs to the *hour* of *labour*, and which may allude to its closing its leaflets together at night, and expanding them by day." But if the origin of its classical name be obscure, the Laburnum has been welcomed with many popular names both here and on the Continent. The French name *l'aubour* is said to be merely a corruption of Laburnum; but the tree is also known as *arbois*, which is said to be *arc-bois*, bow-wood, its wood having been used, owing to its lasting strength and elasticity, for bows by the ancient Gauls, and being still so employed around Macon. In Scotland the blossom has gained for it the names of "Pea-tree" and "He Broom," the latter meaning probably High Broom, as opposed to the common Broom and the Low Broom, *Genis'ta tinctor'ia* L.; whilst some likeness to a Willow has earned the names "Hoburn Saugh" here and "Weeping" or "Drooping Willow" in Devon. A recognition of true affinity underlies the Shropshire "French Broom" and "Seyny" (Senna) tree, "French" standing for anything foreign, as it does also in the Derbyshire "French Ash." It is, no doubt, the smooth olive-green bark that has suggested this last name, and the "Chaney (China) Ash" of

Cheshire. "Ear-rings" and "Watch-guards" are other popular names from this last-mentioned county. The Yorkshire "Lady's Fingers" and the Lincolnshire "Golden Drops" are, perhaps, in most districts preoccupied by other plants; but it is somewhat remarkable that we only have records of the use of "Golden Shower" and "Golden Rain" from Shropshire and Surrey respectively, whilst by far the most widely distributed popular name for the tree is the less imaginative "Golden Chain."

The Laburnum reaches a height of twenty or thirty feet, retaining a smooth grey-green rind on which the "lenticels" or cork-warts are somewhat conspicuous. A thin paper-like epiderm is, in fact, sloughed off by the shoots at an early stage, so that the permanent surface is a secondary periderm. As it is not a fast-growing tree, its wood is dense and often shows very regularly concentric growth, the few outer rings of yellow sapwood sharply contrasting with the heart, which varies from a yellowish-brown through greenish-brown to black. It is this heartwood, which will take an excellent polish, that has gained the tree its common French name, *Faux Ebénier*, and gave it in ancient times the name of Corsican Ebony. A glance at the photomicrograph of the wood, one of the most beautiful results of this method of study, will suggest the complexity of its structure. The four annual rings, of which parts are here shown, are seen to be crossed by more than a dozen distinct pith-rays; and the spring-wood, or inner third of each ring, shows the large open pores or vessels crowded in groups of six to eight between these rays, making an

LABURNUM FLOWER AND FRUIT.

almost continuous ring, so that the wood is classed as "ring-porous." The vessels formed later in the year make crescentic groups, producing the effect of a series of undulating lines also nearly continuous round the stem. In the denser, more opaque portion, a more minute study would reveal tracheids, differing from the vessels mainly in their lesser diameter and length, wood-fibre and cellular tissue. It is these elongated but dense elements of its structure that render the wood at once so flexible as to be suitable for bows, and so hard as to be used as a veneer in cabinet work.

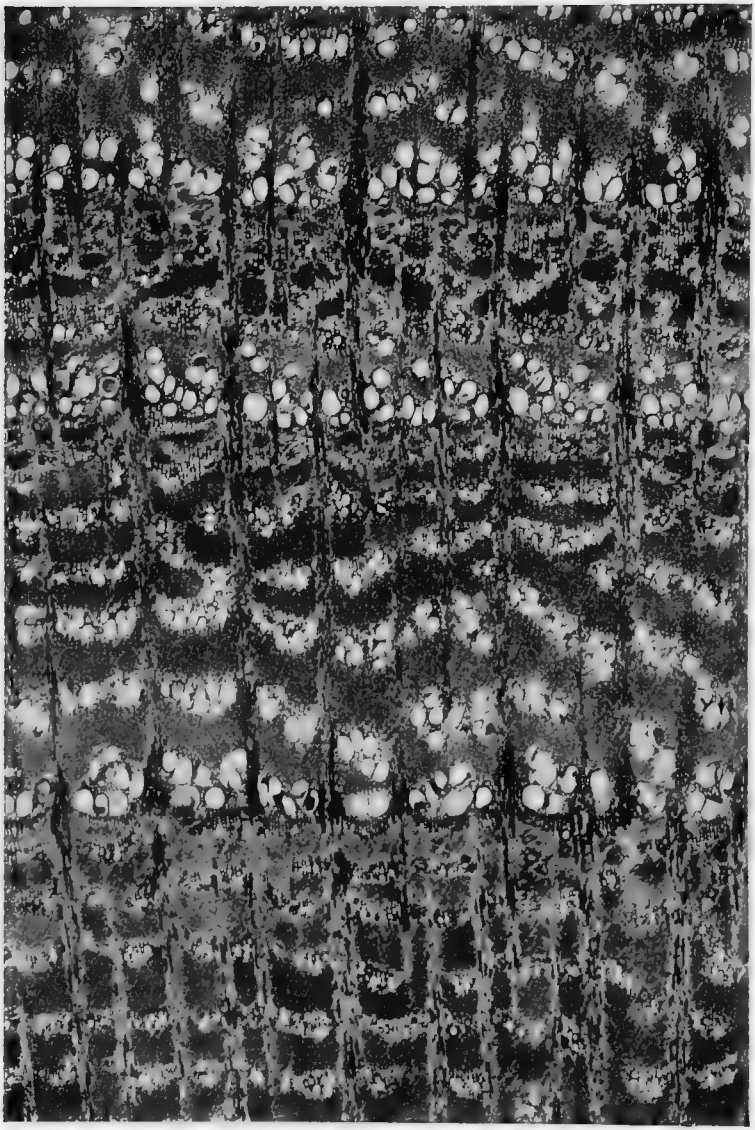
The tree does not branch very copiously, as many of its small side buds give rise to short dwarf-shoots marked with closely-ranged ring-scars of the bud-scales. Leaves and flowers appear simultaneously in May, the former being grouped together in tufts. The leaf-stalks are long, and each of the three elliptical leaflets is furnished with a minute stalk or *petiolule*. The central leaflet has a slight joint or articulation at its base which indicates that this compound leaf, unlike that of the Clover, belongs to the pinnate type. Two small persistent stipules occur at the base of the leaf-stalk, and the young shoots and the under surfaces of the young leaves are alike covered with a silvery coating of flat silky hairs.

Digging near the roots of old Laburnum trees, we shall probably come across curious coral-like masses of tubercles which we shall find to be attached to the roots, and which we might well take for galls. These "exostoses," as they are termed, occur on almost every member of the Order *Leguminosæ;* but are particularly large on the Laburnum, the clusters in

this case being often a couple of inches across. They are metamorphosed lateral rootlets, and are produced by the attacks of certain lowly microscopic fungi or bacilli known as *Rhizo'bium*. These bacilli live in, and to some extent upon, the tissues of the Laburnum root, causing them to grow out into these swellings; but this is no mere case of parasitism, for the tree is none the worse, but probably much better, for the presence of the fungi. The bacilli have the property of assimilating the free nitrogen of the atmosphere, and the Laburnum apparently actually consumes or digests the bacilli in its root-cells with the nitrogenous compounds they contain. The association of the two plants is, therefore, a case of *symbiosis*, or living together for mutual benefit; and the important result, so far as man is concerned, is that in this way leguminous plants, instead of exhausting the soil in which they grow, actually enrich it, either by the decay of their roots or when ploughed in as "green manure."

The hanging clusters of golden blossoms, sometimes nearly a foot in length, and so thickly set upon the tree that its foliage is well-nigh hidden, are the peculiar glory of the Laburnum. It is noticeable that each flower-bud before it opens is inverted, as if intended for an upright flower-spike; so that, as it opens, it has to twist through an angle of 180°, much as do the flowers of most orchids. While the cluster hangs vertically downward, each blossom stands horizontally, and its stamens and pistils are enclosed within the keel-petals and so protected from rain. The honey is secreted by the inner surface of the filaments near their base, and thus accumulates in the

LABURNUM.



TRANSVERSE SECTION OF LABURNUM WOOD (X 30 DIAMETERS).

tube which they make round the ovary; but, since in the genus *Cytisus* and a few allied groups, such as the Furze, all ten stamens are united, this tube is a complete one, so that the honey is effectually concealed at some depth within the flower, and only a clever insect with a tolerably long tongue can reach it. The anthers, moreover, ripen their pollen rather before the surface of the stigma shows by its stickiness that it is ready to receive the pollen-grains; and just below the stigma is a circle of hairs which may hinder the pollen of the stamens from reaching it.

All this complex structure is a special adaptation for cross-pollination by bees; and, in striking contradiction to Pliny's statement, bees are the chief insects which visit Laburnum blossoms. Alighting upon the wing-petals, the insects depress them by their weight; and as the wing-petals are moulded with a protuberance fitting into a corresponding hollow in the keel-petals, the latter are depressed at the same time. This exposes the stamens and stigma until the bee's weight is removed, when they will be again covered by the keel-petals. It would seem that in a freshly-expanded blossom only the short stamens are protruded, and they will dust the abdomen of the bee with pollen; but when the flower is a day or two older the pistil and longer stamens emerge and deposit pollen on the back of the visiting insect. Thus the pollen obtained at these two stages of development will reach stigmas of other flowers differing in the length and progressive curvature of their styles. To reach the honey the bee bores through a swelling just below the standard petal. Possibly at a later stage, if not already cross-

pollinated, the stigma may by this curvature of the style be brought into contact with any remaining pollen of its own flower.

The blossoms are followed by silky green pods which turn black as they ripen, and then burst elastically by the contraction on drying of certain oblique groups of cells in each valve. Thus the black seeds are scattered to some little distance.

All the green parts of the plant are poisonous, containing an irritant emetic principle known as *cytisin ;* but this appears to exist in a peculiarly concentrated form in the seed. In its germination this seed resembles a bean rather than a pea, since the cotyledons rise above ground, become green and act as the two first foliage-leaves, whereas those of the pea remain as mere storehouses of nutriment within the seed. These seed-leaves are stalkless, elliptical, and fleshy, in no way resembling the subsequently-produced foliage, and a slight want of symmetry in the seed renders the two halves of each cotyledon unequal.

Of considerable interest is *Cytisus Adami* Poir., often known in gardens as *C. purpuras'cens*, or Purple Laburnum, which bears three kinds of blossoms, yellow, purple, and an intermediate brick-red, on one tree, or even in one cluster. It originated in Paris in 1828, when M. Jean Louis Adam inserted a bud of the Weeping Purple Broom, *C. purpu'reus* Scop., into a Laburnum stock. Apparently a "graft-hybrid" was formed, the two species becoming intimately united in their growing-tissue or cambium.

MULBERRY.

THE MULBERRY.

Mor'us ni'gra Poir.

THE great majority of broad-leaved trees belong to those groups which, owing to their general lack of a corolla, and sometimes of a calyx as well, have long been known as *Incompletæ*. In plants with flowers thus simplified the stamens and carpels not infrequently occur either in different flowers on the same tree, when the plant is termed *monœcious*, or even on distinct trees, when it is termed *diœcious*. In these *Incompletæ*, moreover, whether the stamens and carpels are thus separated or not, there is commonly a lack of both honey and perfume. In the absence of these inducements, insects do not visit the blossoms; and, in the production of a large amount of small smooth-grained pollen, often maturing in stamens which hang prominently out of the flower, and which may even ripen before the leaves unfold from the buds in early spring-we see especial adaptations for wind-pollination.

An assemblage of groups with such simple types of flower was known as the *Urtica'ceæ*, or Nettle Order, and not only Nettles, but Hemp, Hops, Figs, Mulberries, Breadfruit, and Elms were all lumped together into this one Order, until botanists themselves recognised it as a mere confession of ignorance and came to know it as "the marine-store shop."

The Order *Mor'aceæ*, as at present limited, con-

sists mainly of trees belonging to tropical and sub-tropical regions and agreeing in the possession of a milky juice or "latex," which in many cases contains a certain amount of rubber. Unlike the Elms, they invariably have their stamens and carpels in distinct flowers, the perianth usually consisting of four minute leaves which remain in the fruit stage. The stamens are also generally four in each flower in which any occur, and their anthers are not explosive like those of Nettles. The ovary and ovule are in general like those of the *Ulma'ceæ;* but in many cases, as in Figs and Mulberries, the fruits of whole clusters of flowers become united into remarkable structures known generally as "multiple fruits." In the Mulberry the staminate and carpellate flowers are borne in distinct clusters, a tree sometimes bearing one type of flower exclusively; and obviously the multiple fruit that we know as a Mulberry is the product of the carpellate clusters only.

As these clusters contain several, but not a large number of flowers, and are pendulous, we may roughly compare them to the hanging racemes of the Red Currant, the Gooseberry, or the scarlet *Ri'bes,* though we shall soon perceive a wide difference in their subsequent development. In the *Ribes* the petals and stamens—for there are stamens—disappear, and each flower forms a fruit crowned with the withered remains of the calyx. In the Mulberry the four small green leaves of the perianth become enlarged and change colour till, save for a delicate epidermis, they consist

of little but juice, and touch those of the other flowers of the cluster. The Mulberry thus formed corresponds, therefore, approximately to a whole bunch of Currants, whilst the true fruits are small, round, dry capsules, each enclosed by its four juicy perianth-leaves.

The Black Mulberry (*Morus nigra* Poir), the only species familiar to us in England, is, of course, so called from the colour of the ripe fruit, though, as a matter of fact, some varieties of the so-called White Mulberry (*M. alba* L.) also have black fruit. It is generally a much-branched tree, not exceeding a total height of thirty feet; but it forms a single stem from one foot to three feet in diameter, with a thick, rough, reddish-brown bark. This gives off large horizontal branches at the height of a very few feet, and these again branching produce a large rounded head, which when in full leaf affords a perfect shade.

The leaves are very harsh in texture and of a dark green colour, which characters combine to give the impression that they are thicker than they really are. They vary considerably in form and size; but may be described as generally broadly ovate with a cordate base, an acute apex and a coarsely irregularly serrate margin, and not much exceeding four inches in length or breadth. The leaf-stalk is seldom more than a quarter the length of the blade, and is flanked by two linear stipules. The young leaves are softly hairy on their under surfaces, and may remain so, whilst the harshness of the upper surfaces is produced by the greater stiffness of the hairs borne by them. Suckers from the base of old stems, or less commonly the

ordinary branches, bear leaves with from three to five lobes, much resembling those of the common Fig. In autumn the foliage turns to a clear yellow like that of the Wych Elm, to which in several respects it bears considerable resemblance.

We have in the flowers of this species a gradual transition from the monœcious to the diœcious condition. Some specimens produce staminate and carpellate clusters equally; in others most of the flowers are staminate or most of them are carpellate; and lastly trees sometimes occur with flowers exclusively of one sex. The staminate flowers are in catkins, and the carpellate ones in a spike-like group which does not at first hang downwards; but both are of an inconspicuous greenish white, the pollen being carried by the wind and no inducements to bring insect visitants being, therefore, needed.

To what we have already said as to the structure of the multiple fruit or "sorosis," as it is technically termed, we need only add that it becomes an irregularly oval mass about an inch long and turns from green to crimson and then darkens to a reddish black. Though somewhat resembling the Blackberry, with which, indeed, it is confounded in the Latin Classics, in Early English writings, and in some counties' folk-lore to-day, there is no real similarity of structure, the Blackberry being made up of the numerous carpels of a single flower.

Physiologically the Mulberry is remarkable for its slow growth, its late leafing, and its great tenacity of life. Trees twelve years old are often not nine feet high and have stems little more than an inch in

MULBERRY FLOWERS, FRUIT, AND LEAVES.

diameter. The buds seldom unfold till May, when all danger from frost is over, and Pliny seems to suggest the entirely unwarrantable etymology of *Morus* from *mora*, delay, on this account. "Other trees," he says, "blossom and bud but late, while the fruit comes to maturity with great rapidity. The Mulberry, for example, which is the very last to bud of all cultivated trees, and does so only when the cold weather is gone, has for this reason been pronounced the wisest among the trees."

This, no doubt, was the suggestion for Mrs. Craik's poem :—

"O, the Mulberry-tree is of trees the queen!
Bare long after the rest are green;
But as time steals onwards, while none perceives
Slowly she clothes herself with leaves——
Hides her fruit under them, hard to find.

* * * *

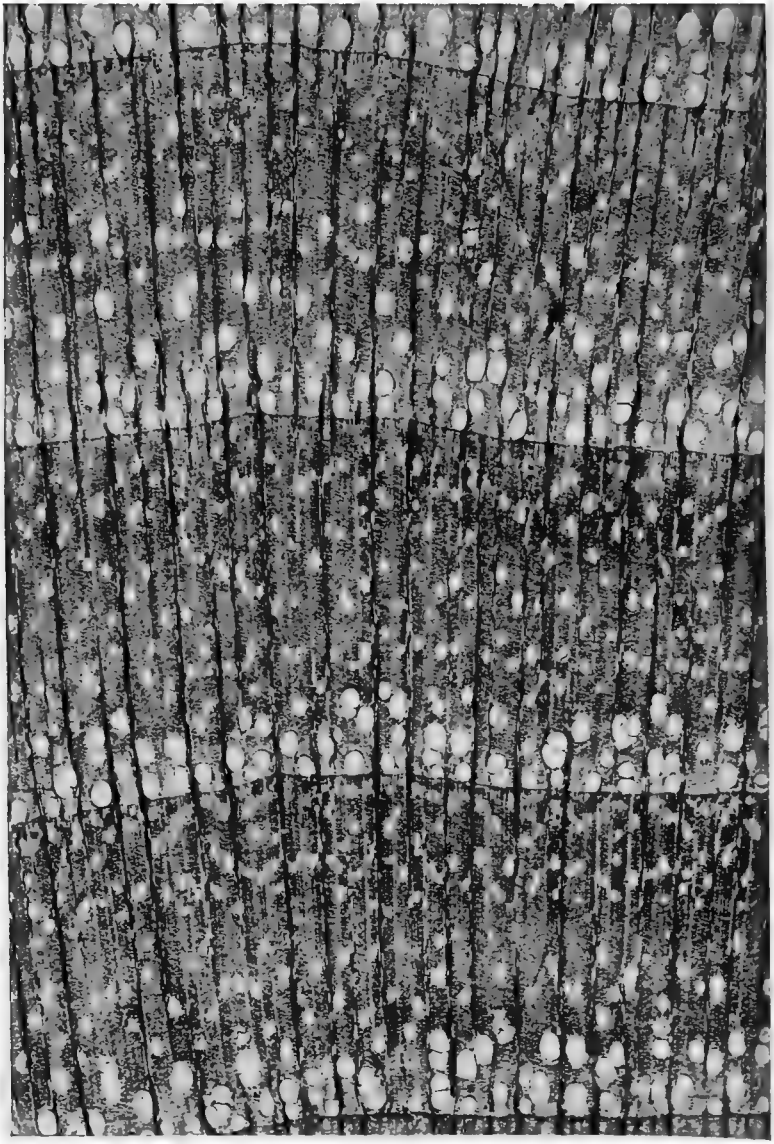
But by-and-by, when the flowers grow few
And the fruits are dwindling and small to view——
Out she comes in her matron grace
With the purple myriads of her race;
Full of plenty from root to crown,
Showering plenty her feet adown,
While far over head hang gorgeously
Large luscious berries of sanguine dye,
For the best grows highest, always highest,
Upon the Mulberry-tree."

Few people are aware of the vigorous tenacity of life in old woody portions of the Mulberry. We have known large limbs, several inches in diameter, which had been accidentally broken from a fine old Mulberry-tree in mid-winter, to be planted and to sprout into leaf nearly eighteen

months later, forming at once good-sized trees. Nearly related to this characteristic is the longevity of this species. The oldest existing trees in England are almost certainly those at Syon. These may have been planted by Dr. William Turner himself, "the father of English botany," in 1547 or 1548; for that ardent Protestant, after studying botany and medicine abroad during the later years of Henry VIII.'s reign, returned to England soon after the accession of Edward VI., and acted as physician to the Protector Somerset, who had then got possession of the monastery of Syon. These old trees, still vigorous, though now nearly prostrate, may even date back farther to pre-Reformation times. Though of far less antiquity, we must here mention also the many fine Mulberries in the gardens of the colleges at Oxford and at Cambridge, especially the tree planted by Milton at Christ's College, Cambridge, and the little grove of trees still bearing an annual fruit crop in the heart of London, in the garden of the Charterhouse.

The Black Mulberry is probably wild in Northern Persia and Armenia, and, though it has no Sanskrit name, was introduced into Greece at an early date. Theophrastus speaks of it under the name *Sukami'nos*, recognising its relationship to the Figs, and it appears under the same name, viz. Sycamine-tree, in St. Luke's Gospel and in the curious passage in the First Book of Maccabees which speaks of elephants being infuriated by the sight of its juice. In some passages in Horace and Ovid the word *mora* probably signifies Black-

MULBERRY.



TRANSVERSE SECTION OF MULBERRY WOOD (X 20 DIAMETERS).

berries; but the story of Pyramus and Thisbe told in Ovid's "Metamorphoses," and yet more familiar to us from the burlesque of it in *A Midsummer Night's Dream*, has suggested to a very high authority that there must have been some knowledge of the White Mulberry as well as of the Black in Ovid's time. The scene of the tale is laid at Babylon: Thisbe flies from a lioness whose mouth is bloody from the recent slaughter of an ox: Pyramus, her lover, coming to the rendezvous and finding her blood-stained garment, thinks her dead, and kills himself at the foot of a Mulberry-tree; and Thisbe, returning, does the same. The poet then tells us that the fruit of the tree till then was snow-white; but when the lovers' blood flowed over its roots and was absorbed into the sap—

> "Dark in the rising tide the berries grew,
> And, white no longer, took a sable hue;
> But, brighter crimson, springing from the root,
> Shot through the black, and purpled o'er the fruit."

Undoubtedly, though less suited for the purpose, and now valued rather for its fruit, the Black Mulberry was used as food for the silkworm in Southern Europe before the more delicate *Morus alba*. Its hardier nature also led to its introduction into Britain long before the attempt was made to grow silk in this country. In Archbishop Ælfric's tenth-century vocabulary we have in the list of trees "*Morus, vel rubus*, mor-beam"; but in the same list appears "*Flavi, vel mori*, blaceberian"; so that it is at least possible that the drink known as morat,

said in Turner's "Anglo-Saxons" to have been a favourite compound of honey, was flavoured not with Mulberries but with Blackberries.

In his "Names of Herbes," in 1548, Turner says:—"Morus is called in greeke morea, in englishe a mulbery tree, in duch maulberbaum, in french murier, it groweth in diverse gardines in Englande."

In 1596 Gerard had both species growing in his Holborn garden, and in 1609 James I., emulating the example of Henry IV. of France, did his best by precept and example, and the distribution of seed and young trees, to spread the cultivation of the Mulberry and the rearing of the silkworm in England. But, though there is a large and undoubtedly ancient White Mulberry at Syon House, these seventeenth-century trees, the presence of which on a lawn has been said to be a patent of nobility to any garden, are almost all Black Mulberries. The courtly playwright William Shakespere, who had in *Coriolanus* shown his familiarity with the fruit "that will not bear the handling," responded to the royal suggestion and planted at New Place, Stratford-on-Avon, the tree which Mr. Gastrell cut down when he destroyed the house in 1756. Two trees raised from this were planted by Garrick at his villa at Hampton, when, as Cowper says:—

"The mulberry-tree was hung with blooming wreaths;
The mulberry-tree stood centre of the dance;
The mulberry-tree was hymn'd with dulcet airs;
And from his touchwood trunk the mulberry-tree
Supplied such relics as devotion holds
Still sacred."

CLUSTER PINE.

THE CLUSTER PINE.

Pi'nus Pinas'ter Ait.

It appears tolerably certain that we have in the *Abieti'næ* the most highly specialised forms of Conifers, and that, among the *Abietinæ*, this pre-eminence belongs to the genus *Pi'nus*. It is also to be borne in mind that the two genera *Pinus* and *A'bies*—rivalled, if at all, by their close allies the Spruces (*Pice'a*), Larches (*La'rix*), and Hemlocks (*Tsu'ga*)—by their immense multiplication of individuals, often constituting "pure" forests of single species, cover wider areas in the Northern Hemisphere than those occupied by any species of tree in any quarter of the globe.

The *Abietinæ* are almost all of them lofty trees, more or less pyramidal in outline, their branches, which are given off approximately in whorls, being generally of insignificant bulk as compared with that of the main trunk. Their stems grow erect and straight to heights of a hundred to two hundred feet, with a regularly tapering outline, and sometimes become free of branches for more than half their height from the ground. This arises from the important character, presented also by the Sequoias, of the early decay and throwing off of the side branches. Thus the branches, it has been said, "in a physiological point of view, may be considered as rather like immense leaves than

branches"; whilst the stems are, by this characteristic, specially fitted for use as masts or as scaffold-poles. Pines and Cedars depart most from this pyramidal habit of growth, their heads becoming round and flattened as they grow old, while they also throw out more or less horizontal branches of considerable bulk. The bark is scaly and generally thin, though here again the Pines are somewhat exceptional.

The roots spread horizontally but little below the surface of the ground, from an early age. Becoming, however, very woody and tough, they afford more hold on the soil than their form would suggest. In no case do the stumps of these trees produce coppice-shoots.

With the exception of the Larches, the *Abietinæ* are all evergreen, their leaves being needle-shaped, or, at least, very narrow. While in many evergreens the leaves only remain on the tree for about thirteen months, in some of these Conifers they persist for four, five, or even more years. The buds are protected by spirally-arranged scales, which in some genera exude resin, and in others are protected from cold and wet by a felted covering of hair. Seedling Conifers produce, in succession to their cotyledons, other leaves known as "primordial," "protomorphic," or "juvenile," which are simpler in arrangement, form, and structure than those produced later. All the leaves in this group are arranged spirally, and not in the decussating pairs common in the Cypress tribe, and they spring generally from bracket-like

projections of the corky layer of the bark known as "pulvini." Hard and rigid in texture, with a single midrib and without any lateral veins, the needle-shaped leaves are, as we have seen, specially adapted to dry or "xerophytic" surroundings, and the position of their resin-ducts and other internal structure serves as a means of discriminating the species.

One very important character for the classification of the *Abietinæ*, however, is afforded by the leaf-arrangement. Whilst in the Firs (*Abies*), Douglas Fir (*Pseudotsu'ga*), Hemlock Spruces (*Tsuga*), and Spruces (*Picea*), the trees only bear one kind of shoot, those, namely, of unlimited growth, and the leaves spring singly from these shoots, Cedars, Larches, and Pines bear their leaves in a more or less tufted manner, producing both long and short, or dwarf shoots—shoots, that is, of unlimited and of limited growth. In Larches and Cedars, both kinds of shoot bear needle-like leaves. The genus *Pinus* is widely different, its long shoots bearing nothing but scale-leaves, while the dwarf shoots have both scale-leaves and needles.

The flowers of the *Abietinæ* are always monœcious. The staminate or male flowers are collected in dense clusters near the ends of the last year's shoots, each consisting of an elongated axis bearing several membranous bracts at its base, and a cylindrical mass of densely and spirally arranged yellow stamens. Each stamen consists of two pollen-sacs on a scale-like "sporophyll" or "filament," which expands at the apex into a "con-

nective," the pollen-sacs splitting longitudinally when the pollen is mature. Then it is that we hear of the "showers of sulphur" which have often terrified the superstitious. This pollen is furnished with the wing-like air-bladders to which we have alluded elsewhere.

The cones, it is now generally agreed, are more probably inflorescences than flowers, the axis bearing scales arranged spirally. We may say either that these scales are produced in pairs, one immediately above the other, or that one is borne in the axil of the other. The lower scale in each pair is variously called by botanists of two schools the "bract" or the "carpel"; the upper may safely be designated the "ovuliferous scale," though theorists deem it either "dwarf shoot" or "placenta." Whilst in the *Araucari'næ* and *Taxodi'næ* the two scales in each pair are mainly coalescent, in the *Abietinæ* they are distinct. In the Firs and Larches the bract-scale is longer than the ovuliferous one; in the Cedars and Spruces it is rudimentary; and in the Pines it soon disappears or coalesces with the ovuliferous scale. Each ovuliferous scale in the group bears two ovules in an inverted position, so that the expanded "micropyle," the entrance for the pollen-grain, is between the bases of two contiguous scales of the cone.

As the cone ripens, the woody ovuliferous scale may either become flat, as in most of the genera; or it may be thickened at the apex into a rhomboid mass known as the "apophysis," forming the whole of the scale exposed on the surface of the unripe

MALE FLOWERS AND RIPE CONES
OF CLUSTER PINE.

cone, and terminating in a central blunt point or prickle.

The principal genera of the tribe *Abietinæ* may be grouped as follows :—

Sub-tribe *Pineæ*. Branches whorled; long and short shoots both present; long shoots with scale-leaves only, needle-leaves fascicled on the dwarf shoots, evergreen; cone-scales thickened at the apex; seeds ripening in two or three years.—1. *Pinus*.

Sub-tribe *Lari'ceæ*. Branching irregular; long and short shoots both present; needle-leaves on both kinds of shoots, fascicled on the dwarf shoots; cone-scales flat.

Seeds ripening in two or three years; cone-scales persistent; leaves evergreen.—2. *Ce'drus*.

Seeds ripening in one year; leaves deciduous.

Cone-scales deciduous.—3. *Pseudola'rix*.

Cone-scales persistent.—4. *Larix*.

Sub-tribe *Sapi'neæ*. Branches whorled; shoots of one kind only, *i.e.* long, no dwarf ones; leaves of one kind, arranged singly; cone-scales flat; seeds ripening in one year.

Leaves four-angled, with one or two lateral resin-canals: cones pendulous, falling off entire.—5. *Picea*.

Leaves flat, with a central resin-canal; cones pendulous, falling off entire.—6. *Tsuga*.

Leaves flat, with two lateral resin-canals; cones pendulous, falling off entire.—7. *Pseudotsuga*.

Leaves flat, with two lateral resin-canals; cones large, erect, falling to pieces when ripe.—8. *Abies*.

As will be seen by this table, the Pines, the most specialised members of the series, occupy a very dis-

tinct position, so that the veriest tyro would have little difficulty in at once recognising one of the seventy or more species known to botanists. The evergreen needles grouped together in twos, threes, or fives on the dwarf shoots are at once conclusive on this point; and these three methods of grouping afford the most obvious basis for the subdivision of this comparatively large genus. For our present purposes the following grouping will suffice.

SECTION PINEA. Two needles on each dwarf shoot.

P. Pinaster Ait. The Cluster or Maritime Pine.

P. Lari'cio Poir. The Corsican or Larch Pine.

P. Pinea L. The Stone Pine.

P. sylves'tris L. The Northern Pine or Scots Fir.

SECTION TÆDA. Three needles on each dwarf shoot.

P. Tæda L. The Loblolly Pine of America.

T. palus'tris Mill. The Pitch Pine.

SECTION STRO'BUS. Five needles on each dwarf shoot.

P. Strobus L. The Weymouth or White Pine.

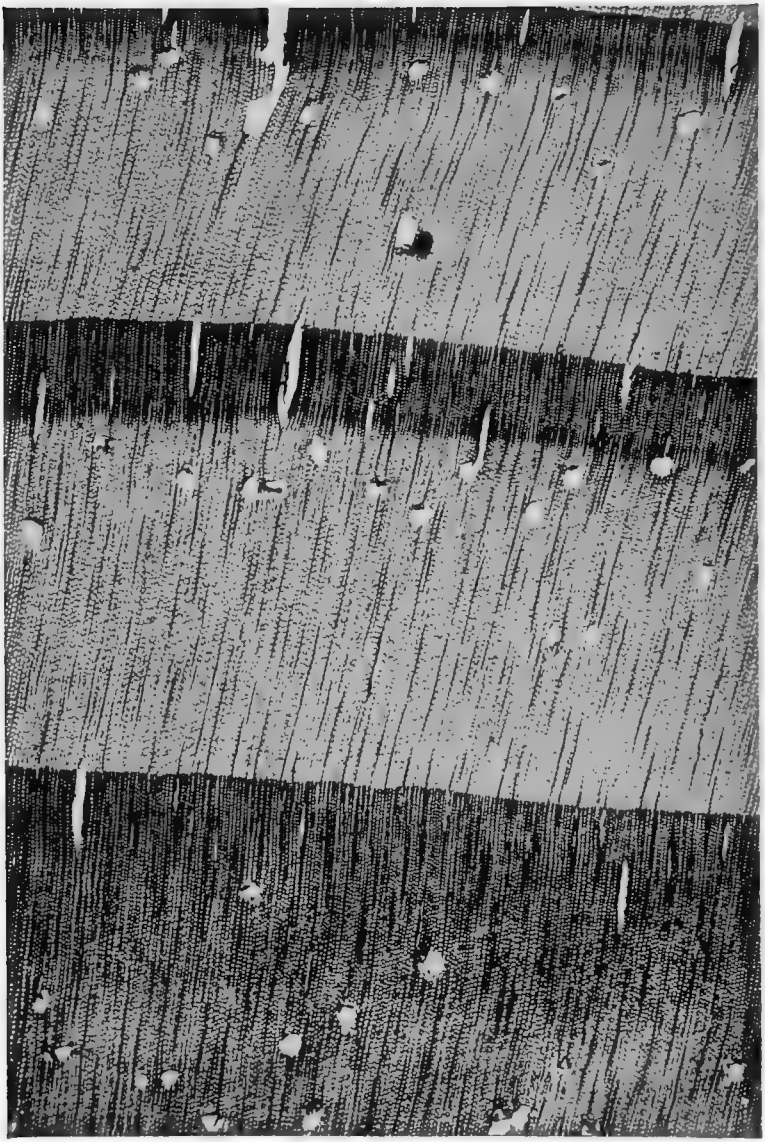
P. Cembra L. The Swiss Stone Pine or Siberian Cedar.

The shape of the leaves as seen in transverse section depends on the number of leaves in a fascicle, those of the Section *Pinea* being plano-convex, those of *Tæda* presenting an obtuse-angled triangle with a curved base, and those of *Strobus* an acute-angled triangle.

The Cluster Pine (*Pinus Pinaster* Ait) is a large, handsome tree of pyramidal form, reaching a

Photo : E. J. Wallis, Kew.

CLUSTER PINE.



TRANSVERSE SECTION OF CLUSTER PINE WOOD (X 10 DIAMETERS).

height of forty to eighty feet. Strictly a native of the shores of the Mediterranean, and flourishing only in sandy soils, no species of the genus has been more widely disseminated artificially; and, after having been introduced into China, Japan, Australia, New Zealand, and Northern India, it has been reintroduced from those countries as if it were a new species. Introduced into England by Gerard in 1596, it has been extensively planted, especially at Westwick, Norfolk, where planting was carried on throughout the eighteenth century, in a bleak situation, on sandy heath land. It is readily distinguished from other Pines by the large clustered masses of long, light-green leaves at the ends of the shoots, alternating with lengths of branch which are bare of leaves. The trunk from an early age is covered with a coarse bark deeply fissured into narrow longitudinal ridges, and the slender, regularly whorled branches invariably bend upward at their extremities. The buds are without any resinous exudation, and covered with whitish-brown reflexed scales, fringed with woolly hairs. The leaves are six to twelve inches long, thick, fleshy, and rigid, with a finely toothed margin and an acute point. They are almost grass-green in colour, with faint white lines of stomata on both surfaces.

The staminate flowers, which in the south of England are generally produced early in June, are of a fawn-yellow colour, about an inch long, and arranged in a loose spike four to six inches long. It is, however, to the star-like clusters of from four

to eight cones that the tree is said to owe the name *Pinaster*. Each cone is from four to six inches long, and about two inches in its greatest diameter, slightly unsymmetrical in its development, and changing from a purplish colour, first to green, and then to a polished light yellow-brown. The apophysis, or exposed surface of each scale of the cone, is rhomboidal, with a keel across its wider diagonal, and a small, sharply-pointed, ash-grey pyramid, or "umbo," in the centre. The seeds are oblong, each having a wing, with which it is nearly two inches long and three-quarters of an inch across.

Though its timber is of but secondary importance, the Cluster Pine is by far the most valuable species of its genus in southern Europe. This is owing to the way in which it binds together shifting sands with its roots and breaks the force of wind and rain, and also to its resinous products. The extensive and highly successful sowing of this species on the shifting dunes between the Adour and the Gironde has earned for this Pine—not there indigenous—the names of "Pin de Bordeaux" and "Pin des Landes."

SECTION OF NEEDLE LEAF OF CLUSTER PINE, HIGHLY MAGNIFIED.

COMMON ELM.

THE COMMON ELM.

Ulmus surculo'sa Stokes.

AMONG our most characteristically English trees, the Common Elm has yet but dubious claims to an existence in this country prior to the Roman occupation, even if its introduction date back as far as that. The name is but slightly altered from the Latin *ulmus*, though still less so from the German form Ulme, whilst but few of our townships take their names from this tree, compared with the number called after the Oak, Yew, or Holly. It is urged, moreover, that the Common Elm seldom ripens its seed in this country, multiplying itself, unlike the Wych Elm, by means of suckers. Its tufts of small flowers, often conspicuous with red or purple anthers on the bare boughs in the middle of leafless March, succeeded by the clusters of pale green "samaras," as the botanists term the flat-winged fruits, might well make us lay the blame of the absence of ripe seed on our climate, as being unnatural to the Elm. It is, however, no exceptional circumstance that this species should not ripen its seed in England, for it seldom does so in any part of Europe or Asia, though the seedling varieties raised by our nurserymen bear witness to the fact that it does occasionally ripen a few seeds.

Native or not native, the "hedge-row Elms" now form a leading feature in most of our southern and midland landscapes, in the avenues of our parks, or

scattered over them in clumps; stripped of their lower boughs on the margins of our cornfields; clipped close so as to contribute to the hedge itself; or in the venerable grandeur of unmolested beauty, as the historic tree on some village green.

The Elms, with three or four other genera, are separated off from the great group of catkin-bearing forest trees to form a distinct Natural Order, the *Ulma'ceæ*. They are confined to the North Temperate zone, and of the genus *Ulmus* there are rather more than a dozen forms admitted to rank as species. These agree in having their leaves "oblique," *i.e.* unequally lobed at the base, one side being larger than the other; in their tufted flowers, which are not in drooping catkins, each containing both stamens and pistils; and in the enclosed ovary having two chambers, though the winged fruit which results therefrom has commonly only one chamber with one seed in it. The position of this seed-chamber in the elliptical fruit furnishes the distinguishing characters of our British Elms: in the Common Elm (*Ulmus surculosa* Stokes) it is above the centre, and near to the little notch at the top of the samara; whilst in the Wych Elm (*U. monta'na* Stokes) it is below the centre. When, however, instead of poring over dried specimens in the herbarium, we examine the living tree, we see at once many other features that impress us with the individuality of several different forms.

When seen at its best the Elm is a very large tree, exceeding even 120 feet in height, and 40 or 50 feet in girth, though seldom over 100 feet high or 30 feet

round; often sending out one or two huge horizontal limbs to a distance of thirty or forty feet from the trunk, and generally forking above into ascending branches, whose multitudinous branchlets and twigs form a rounded top, towering over the green billowy masses that spring from the limbs. Its bark is corky, grey in colour, and scored by those grand vertical furrows of age that mark the expanding rings of wood within, and have earned for the tree the epithet of "rugged." When bare of leaves, and standing black against a dull wintry sky, the tiny twiglets on the topmost boughs appear as delicate lacework, far exceeding in fineness the minutest ornament of the Gothic architect, and yet graduating downwards into mighty beams, so as to suggest at once the strength of Nature's framework and the delicacy of her finish.

Amidst the fall of the early capsules in April the leaves unfold, first on one spray, waving near the summit, and then, within a day or two, over the whole tree, so that a veteran, perchance some three centuries in age, appears before us in a clear green robe, suggestive in its delicacy of perpetual youth.

The 18th of April has been termed *Ulmifron'des*, for then, in the south of England, the tree is generally in full foliage. In May its leaves have assumed a darker, duller hue, and but for its charms of outline, the Elm would be a heavy, monotonous item in the landscape. In August and September, when other trees are changing hue on every side, emulating in the hectic and garish gaiety of decay the brilliancy of spring, the Elm retains its sombre green; and, not until the gales of the equinox have stripped its

neighbours bare to the blast, does it commence that after-glow of colour that marks a fine October, one bough becoming a bright golden yellow, and then, while the others follow its example, dying to a pure brown.

The Common Elm is most abundant to the south of the Trent, and in this district almost every neighbourhood has its famous old Elm, celebrated for age and size, beside a roadside inn, or associated with the good Queen Bess or some other historic character. In the home-meadow of an old English grange the row of Elms will generally be clamorous with the hoarse voices of rooks, who are seen in spring deftly arranging dead twigs to form those homes which, when deserted, wave among the bare branches like blots upon the sky. The Elm is not particular as to soil, but flourishes best in a deep clayey loam in sheltered valleys. In sand or gravel its roots spread horizontally near the surface of the ground, their ends watered by the drippings from its long limbs, and they are thus liable to be laid bare by the removal of the surface soil through the action of the rain, and to cause, through their loose hold in the earth, the overthrow of the whole tree. Another misfortune to which the Elm is peculiarly liable is the loss of its large horizontal limbs, a loss which, though sometimes attributable to the action of frost, seems often only to be accounted for by supposing that they have elongated themselves, regardless of gravitation, beyond the cohesive power of their woody tissue; unless, indeed, we adopt the squirrel's explanation in Richard Jefferies' charming fable, "Wood Magic":

FLOWERS, FRUIT, AND LEAVES OF COMMON ELM.

"'Elms are very treacherous, and I recommend you to have nothing to do with them, dear.'

"'But how could he hurt me?' said Bevis.

"'He can wait till you go under him,' said the squirrel, 'and then drop that big bough on you. He has had that bough waiting to drop on somebody for quite ten years. Just look up and see how thick it is, and heavy; why, it would smash a man out flat. Now, the reason the Elms are so dangerous is because they will wait so long till somebody passes. Trees can do a great deal, I can tell you: why, I have known a tree, when it could not drop a bough, fall down altogether when there was not a breath of wind nor any lightning, just to kill a cow or a sheep out of sheer bad temper.'"

The stems of old Elms often become distorted with huge wart-like swellings, that put out tufts of little leafy twigs, especially when branches have been removed by man or nature. The wood of these swellings is ornamentally mottled, and takes a better polish than the ordinary timber of the tree, and is therefore valued for veneering; and in France the trees are sometimes lopped on purpose to produce these knots. The chief insect foes of the Elm are the caterpillar of the Goat-moth (*Cos'sus ligniper'da*), which eats its way into the wood, and the Elm-bark Beetle (*Scol'ytus destructor*). This latter insect pierces innumerable holes through the bark, and forms extensive branching galleries in the inner bark and young wood. The remedies suggested are various; but the best is the preventive measure of not allowing the felled trunks of infested Elms to remain on the ground with their bark on. Far more disfiguring, however, than these defects are those caused by man's ill-treatment. In many agricultural counties the Elms may be seen trimmed, to a height of forty or fifty feet, of every bough, so that they resemble

nothing in nature but an aged Holly-hock or a gigantic Brussels-sprout. In this pruning the cut ends are often carelessly made, so that wet-rot and decay eat from them into the centre of the stem. Neglect of broken or pruned branches affords a lodgment to the spores of the Shelf-fungi (*Poly'-porus*), the spawn of which then spreads throughout the stem, producing a zone of touchwood which any casual wind-gust may snap. Even when completely hollow, a battered veteran will long retain enough vitality in its mere shell to put forth some leaves each year.

The timber of the Elm is too useful to be thus wantonly destroyed. The whole log can be used, the lighter sapwood being as durable as the brown heart, and when kept perfectly dry or completely under water it is peculiarly imperishable. Hollowed Elm logs were formerly almost exclusively used for water-pipes, which are often disinterred even now in the older parts of London, and the wood is still employed for ships' pumps, keels, and bilge-boards, as well as for chairs and furniture. When alternately wet and dry it decays rapidly; and thus, in the use to which the greatest quantity is now put, to form our last resting-places on earth, it soon returns our dust to that whence we were taken.

The Elm is so variable in the degree of corkiness of the stem and branches, the smoothness or downiness of the young twigs, and the size of the leaf, that we can hardly avoid considering *Ulmus surculosa* as rather a group of allied forms than as a single species. Among the recognised varieties of this group

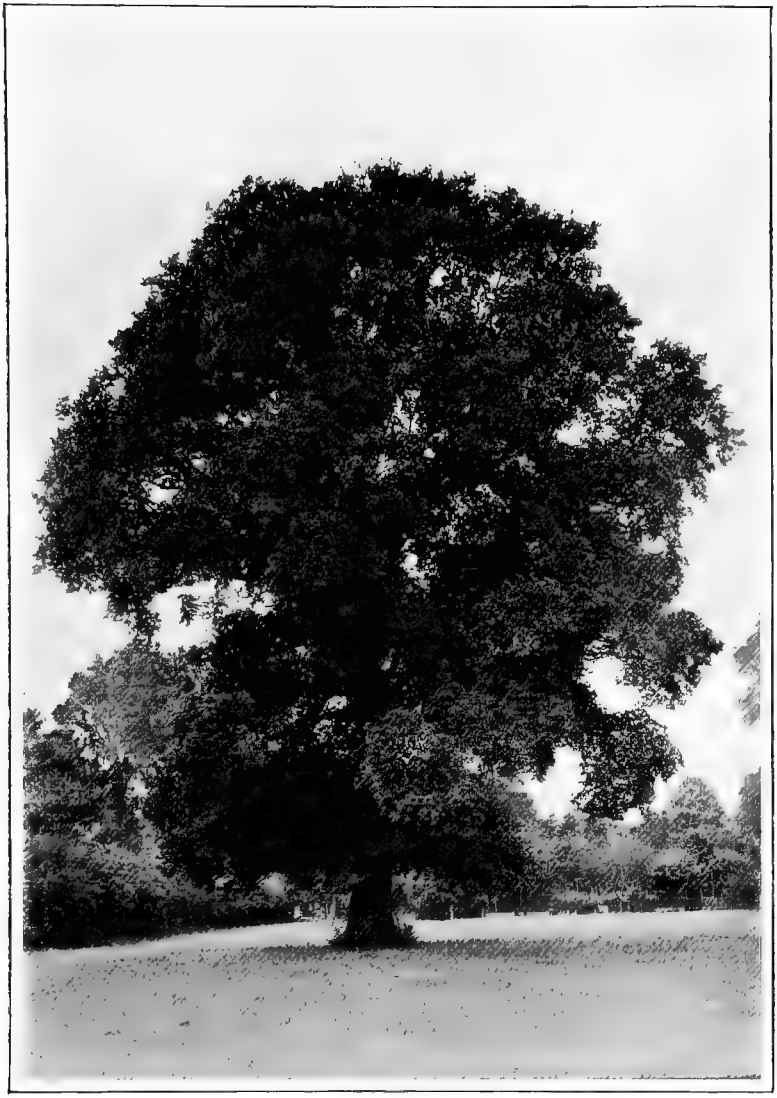
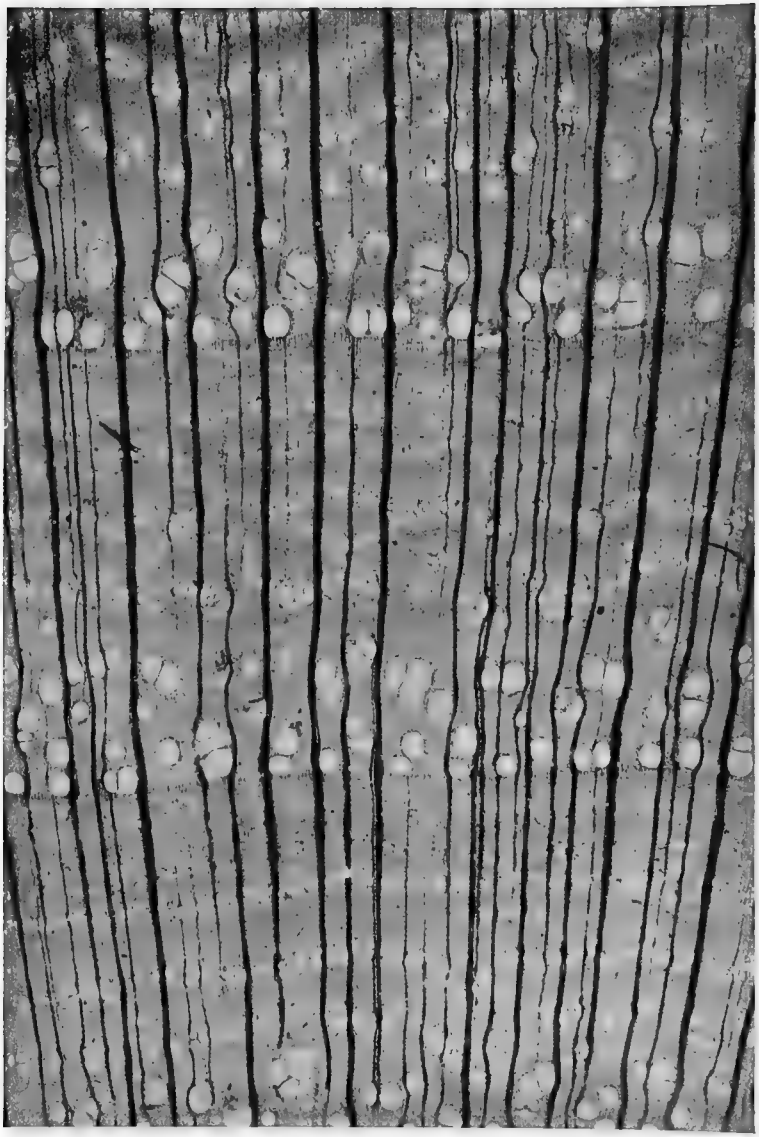


Photo : H. Irving, Horley.

COMMON ELM.



TRANSVERSE SECTION OF WOOD OF COMMON ELM (X 30 DIAMETERS).

are the Hertfordshire, Cornish, Kidbrook, Irish, and Worcestershire Elms; but the leaves of young seedlings, suckers, and mature trees are so much larger than those of the oft-cropped victims of the hedger's shears as to lead to frequent mistakes in regard to specific identity.

It is remarkable that, beyond a few casual allusions, the Elm has attracted but little attention from our poets; and to Spenser, Shakespeare, and Milton it is but "the vine-prop elm" of Virgil's Italian vineyards. On the other hand, though they refer mainly to another species, the following passages from "The Autocrat of the Breakfast Table" are too characteristic both of the tree and of the writer to be omitted.

"I want you to understand, in the first place, that I have a most intense, passionate fondness for trees in general, and have had several romantic attachments to certain trees in particular. Now, if you expect me to hold forth in a 'scientific' way about my tree-loves—to talk, for instance, of the *Ulmus Americana*, and describe the ciliated edges of its samara, and all that, you are an anserine individual, and I must refer you to a dull friend who will discourse to you of such matters. . . . Who cares how many stamens or pistils that little brown flower, which comes out before the leaf, may have to classify it by? What we want is the meaning, the character, the expression of a tree, as a kind and as an individual. I shall never forget my ride and my introduction to the great Johnston Elm. I always tremble for a celebrated tree when I approach it for the first time. . . . I have often fancied the tree was afraid of me, and that a sort of shiver came over it, as over a betrothed maiden when she first stands before the unknown to whom she has been plighted. Before the measuring-tape the proudest tree of them all quails and shrinks into itself. All those stories of four or five men stretching their arms round it and not touching each other's fingers, of one's pacing the shadow at noon and making it so many hundred feet, die upon its leafy lips in the presence of the awful ribbon which has strangled so many false

pretensions. As I rode along the pleasant way, watching eagerly for the object of my journey, the rounded tops of the Elms arose from time to time at the roadside. Wherever one looked taller and fuller than the rest I asked myself—'Is this it?' But as I drew nearer they grew smaller—or it proved, perhaps, that two standing in a line had looked like one, and so deceived me. At last, all at once, when I was not thinking of it—I declare it makes my flesh creep when I think of it now—all at once I saw a great green cloud swelling in the horizon, so vast, so symmetrical, of such Olympian majesty and imperial supremacy among the lesser forest growths, that my heart stopped short, then jumped at my ribs as a hunter springs at a five-barred gate, and I felt all through me, without need of uttering the words, 'This is it!' . . . What makes a first-class Elm? Why, size in the first place, and chiefly. Anything over twenty feet of clear girth, five feet above the ground, and with a spread of branches a hundred feet across, may claim that title, according to my scale. . . . Elms of the second class, generally ranging from fourteen to eighteen feet, are comparatively common. . . . The American Elm is tall, graceful, slender-sprayed, and drooping as if from languor. The English Elm is compact, robust, holds its branches up, and carries its leaves for weeks longer than our own native tree. Is this typical of the creative force on the two sides of the ocean, or not?"

STRAWBERRY-TREE

THE STRAWBERRY-TREE.

Ar'butus U'nedo L.

In many respects the *Gamopet'alæ* are the most highly organised of plants. They exhibit this complexity of organisation especially in their flowers, as we shall presently see in one particular instance. The tree habit, as it is termed, is, however, comparatively rare among them.

The Heath Family, or Order *Erica'ceæ*, however, has an exceptionally general tendency to the formation of wood. Many of its members are alpine or sub-alpine in their habitats and exhibit that characteristic of one type of alpine vegetation, the formation of small, tough, wiry perennial stems of dense wood, though seldom of much height, bearing leathery evergreen leaves often of very small size. Some few, such as some Rhododendrons and the Arbutus, or Strawberry-tree, reach the dimensions of trees; and, whilst some members of the Order, such as Azaleas and Whortleberries, are deciduous, the majority of them, among which are the Heaths, Rhododendrons, and Arbutus, have evergreen leaves. Luxuriating in a peaty soil, and occurring chiefly on dry moors in sub-tropical countries, in swamps and moister uplands farther north, in most parts of the world, in fact, except absolute deserts on the one hand, and the hot damp regions of the tropical jungle on the other, the vegetative structures of the Order exhibit

typically "xerophytic" characters—characters, that is, showing adaptation to a deficient water-supply, at least during part of the year. Of these, the leathery texture of the leaves, with a thick cuticle and a small number of "stomata," or transpiration-pores, is the most general, though in the true Heaths this is accompanied by reduction in the size of the leaves and an inrolling of their edges towards the surface on which the stomata are situated, so as to lessen transpiration still further. Whilst, however, in the true Heaths no true winter-buds are formed, in the sub-division of the Order to which the Arbutus belongs, in which we may say that the xerophytic characters of the Order have to some extent been lost by secondary adaptation, such buds are formed with true bud-scales, though leaves remain on the tree through the winter. In spring these scales are shed, the buds open so that a gap is left on the stem between the last year's leaves and those of the coming season, and these are somewhat crowded at the ends of the twigs in a loose rosette.

There is perhaps no Order which shows such variety and beauty of flower form as we have in the *Ericaceæ*. One is simply horrified at the want of refinement in our botanical terminology that can find no better names than "tubular," "campanulate" or "urceolate," barrel-shaped, forsooth! Words cannot express the exquisite proportions of the flower of the Kalmia, a chalice of snow studded with rubies or blushing in its own chastity, and the shape of the corolla of the Arbutus is almost equally unique in its particular beauty; whilst, when the observant eye

discovers the secret of the contrivances within its cup, the intellect is as charmed by the interior as are the senses by its exterior.

Evergreens dread frost, and are thus characteristic of warm climates, or of those insular conditions in higher latitudes where frost is rare, rather than of the interior of continents, where, though the summer may be hotter, the winter is also colder. This determines the geographical distribution of the Arbutus. Regardless of the chemical characteristics of the soil, it is common all round the Mediterranean from Syria, Anatolia, the Archipelago, Thrace, Greece and Dalmatia, to southern Italy, Algeria, Spain, and the Cevennes. In the Tell, or cultivated coastal region, of Algeria, it flourishes in the brushwood under the shade of the Cork-Oak, and it is particularly abundant in the *maquis* or thickets of Corsica. It extends along the coast of Portugal and the Landes of Bordeaux as far north as Rochelle; but it cannot stand the cold winter of Paris. It has naturalised itself on the warm moist slopes above the Bristol Avon at Clifton, growing there freely from self-sown seed; and it has long existed in the neighbourhood of Killarney.

In the latter locality, where it grows to a large size, ripens its fruit and increases by self-sown seed, it had acquired a local name prior to the first English record of its occurrence there. That, however, was not until the seventeenth century, while the theory of those who do not believe it to be truly wild, is that it may have been introduced by the followers of St. Finian, the leper of sweet Innisfallen, at the close of the sixth century, or by the Franciscans who founded

Muckross Abbey in the fifteenth. The late Professor Babington, who afterwards secured recognition as a critical authority on such questions, visited Killarney in 1835 and came to the conclusion that the Arbutus was indigenous. Similarly, Mr. Edward Step, writing in 1904, speaks of finding it "in the woods at Woodstock, co. Kilkenny, in a situation where it seemed unlikely such a tree would be planted." Considering, however, the extent to which this tree has established itself at Clifton, that the climate of Kerry certainly suits it, that its fruit is greedily eaten by many birds, and its seed so dispersed, and that *ex hypothesi* it may have been introduced four or even eleven centuries ago, we feel bound to admit that it is impossible to hold the introduction theory to be untenable. If, on the other hand, we adopt the general view of Continental botanists, and attribute its existence in Ireland to natural causes, favoured by the mild influence of the Gulf Stream, the Arbutus affords an interesting illustration of one of the most far-reaching speculations of modern geography, that put forward by Hewett Watson in 1832 and independently by Edward Forbes in the year following.

If we look at a map showing the 100-fathom line around the submerged plateau upon which the British Isles stand, we shall see that this sounding sweeps from the north-west coast of the Asturian provinces across the Bay of Biscay, and then turns, considerably to the west of Brittany, towards the coast of Kerry. If, then, in a former age, when the whole of north-western Europe stood more than 600

FLOWERS, FRUIT, AND LEAVES OF STRAWBERRY-TREE.

feet relatively higher with regard to the sea, so that there was a land connection between Ireland and the Asturias, the Arbutus spread along this ancient littoral, as it does along that of the Landes to-day, it may never have spread as far eastward as Brittany or Cornwall for the same reason as that for which it does not grow at Paris to-day. Those places, now maritime, were then relatively Continental.

Familiar in ancient Greece and Italy as in those countries to-day, the Arbutus is frequently mentioned by Classical writers. Theophrastus describes it, under the name *kom'aros*, as a tree not growing to large dimensions, possessing an edible fruit, called *memai'kulon*, a smooth bark, and a leaf intermediate between the Oak and the Bay Laurel. Each blossom, he says, equals in size and form a long Myrtle blossom, so that it is formed like an egg-shell cut in half. The fruit takes a year to ripen, so that it is often found on the tree when the new buds are appearing. Virgil, in his third Eclogue, speaks of the tree as pleasing food for young kids, and also mentions it several times in the Georgics; Ovid celebrates its loads of "blushing fruit"; and Horace, in his first Ode, expresses his delight in lying "viridi membra sub Arbuto stratus" (with limbs stretched beneath a green arbutus).

That no monks seem to have succeeded in introducing the tree into England is rendered probable by the entry, "arbutus, crab-tre," in a fifteenth century vocabulary, and by William Turner's writing, in 1548, "Arbutus groweth in Italy, but hath leaues like Quicke-tree, a fruite lyke a strawbery, wherefore it may be called in english strawbery tree, or an arbute tree."

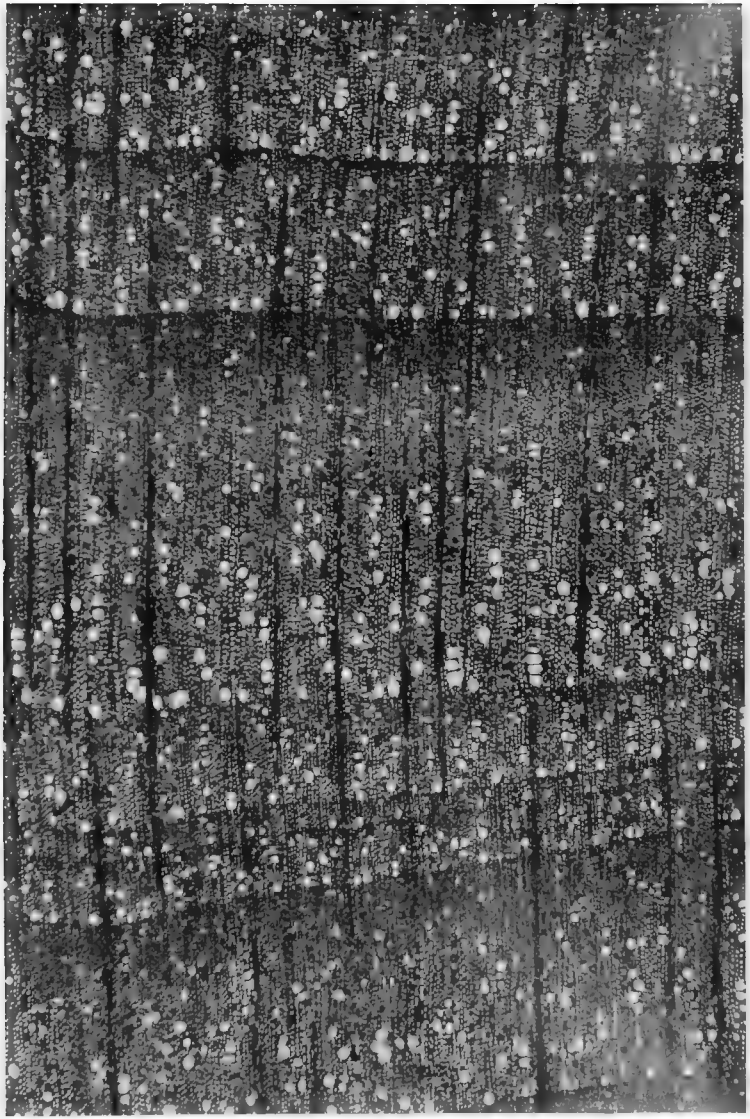
The first reference to the occurrence of the Strawberry-tree in the British Isles is Parkinson's in 1640, when he gives an excellent description of the tree, its rugged red bark, the leaves "very like unto Bay leaves, but . . . without any sent;" the flowers "formed like unto little bottles, or the flowers of Lilly convally," and the "round berryes, greene at the first, yellowish afterwards, and of an excellent reddish colour, and somewhat hoary withall being full ripe, like unto a Strawberry, but much greater in the naturall warme countries, as great as a plumbe, but with us, and in *Ireland*, where they have beene found growing of their own accord, no bigger than a Raspisberrie, and neere unto the same, both forme and colour, that is, like a pallide clarret Wine, of an austere taste."

He adds that it "hath beene of late dayes found in the West part of *Ireland*" and "hath come to us . . . by the name of the Cane-apple, with as great judgment and reason as many other vulgar names are." For this comment the Irish botanist Threlkeld took Parkinson severely to task. "His ignorance of the Irish language," he writes, "made him censure the name, for Pliny called the fruit Pomum, and the word *Caihne* is Irish, so that Mr. Parkinson ought to have forborn his Fling upon the word *Cane-apple*."

Though generally bushy in its growth in England, and seldom much exceeding ten feet in height, the Arbutus in Ireland has exceeded thirty feet in height and has produced a stem over two feet in girth. The warm red-brown of its flaking bark is very striking, contrasting admirably with the dark glossy green of the leathery leaves.

Photo : E. J. Wallis, Kew.

STRAWBERRY-TREE.



TRANSVERSE SECTION OF WOOD OF STRAWBERRY-TREE (X 30 DIAMETERS).

The Arbutus is among the latest of our flowering plants, its loose pendulous clusters of creamy bells, resembling lilies of the valley, but not of quite so dead a white, not opening till September or October. Within each tiny bell-shaped corolla, not half an inch across, ten tiny stamens surround the central column of the style. The ovary is, as it were, the base, a honey-secreting disk the plinth, and the broadened viscid stigma the capital of this column. The ten stamens spring from the base of the corolla-tube, each consisting of short stout filaments coated with hairs and tapering toward the anther. This latter consists of two parallel and united ovoid bags, tapering at each end to a blunt point, each having near one extremity a tail-like process projecting from it almost at a right angle, whilst at the other end of the anther, when immature, is a viscid, pointed appendage.

At first the filaments bend outwards towards the corolla, the tails of the anthers hanging towards its base, whilst the viscid point is cemented low down on the style. A change in the direction of growth of the filaments then takes place, and they bend inwards towards the style as they lengthen, causing the anthers to revolve through about 120 degrees on the point cemented to the style, until their tails point towards the mouth of the corolla-tube and their blunt ends are pressed against the style. Then, while the viscid point has separated from the style and disappeared, a thin membrane closing the end of the anther also disappears, so that the pollen is only kept in as long as the point of the anther is against the style. The pendulous blossoms are much visited by bees, wasps, and the later

butterflies and moths, who, hovering beneath them, thrust their proboscis into the bell to gather the honey clinging to the hairs on the filaments. In doing this, the bees must touch some of the twenty tail-like processes which radiate from the style, like spokes to a wheel, and if they do so, will tear the open mouth of the anther away from its contact with that central column, when the pollen will fall upon the hairy head and back of the insect visitor, to be carried to the stigma of the next blossom against which it may run its head.

The round berries that succeed these elaborate blossoms have a surface projecting in numerous points, more like the fruit of the Litchi than that of the Strawberry, and when they are fully ripe, which is not until fourteen months after the fall of the corollas, they are of an orange-scarlet, and far better worth eating than before. They are divided internally into five chambers, each containing four or five seeds. In Killarney they are eaten, in some parts of France they are preserved, and in Corsica a wine was made from them; but in Southern Italy and on the Riviera they are neglected.

The conversion of the reddish wood of this tree into small mementoes of the spot is the chief industry at Killarney.

CHERRY

THE CHERRY.

Pru'nus A'vium L.

WHETHER we owe the cultivated Cherry in Europe to the luxury of Lucullus, who is said to have first brought this tree from Cerasus, now Kerasoun, in Pontus, or not, the Wild Cherries (*Prunus Pa'dus* L., *P. Avium* L. and *P. Ce'rasus* L.) probably existed before his time—in fact, in a truly indigenous state—throughout the Continent. The three wild forms are popularly distinguished under the names Bird Cherry, (*P. Padus*), Wild Cherry, or Gean (*P. Avium*), and Dwarf Cherry (*P. Cerasus*); and, though they agree in their botanical characters and geographical distribution, there are distinctive features which are sufficiently obvious to be explained in simple language.

To take the last point first, the geographical range of the three forms is nearly the same, namely, from the Himalayas, through Western Asia, Northern Africa, and Europe; but the Dwarf Cherry seems the most restricted form, not occurring either in Scotland or in Africa, whilst the Bird Cherry occurs in the Arctic regions both of Europe and of Asia, and is not wild south of the Thames.

Dealing with the forms separately, the Bird Cherry (*P. Padus* L.) may well come first, as being in several particulars more distinct from the other two than they are from one another. It is a small tree with one main trunk, reaching but ten or twenty feet in

height. Its reddish-brown twigs have cork-warts somewhat elongated transversely, and rather large, pointed buds: its leaves are large, smooth, elliptical, finely and sharply toothed, somewhat obliquely heart-shaped at the base, and tapering to a slender point, and they have generally two glands on the leaf-stalk near its junction with the blade. Such glands, which exude honey, are not uncommon among the *Drupa'ceæ*. The chief distinctive mark of the species is, however, the arrangement of the blossoms, which is what is technically known as a "raceme"—*i.e.* the flowers, which are numerous, spring singly on short stalklets from an elongated pendulous axis, as in the Laburnum —an arrangement altogether different, as we shall see, from that in the other two forms, and one which brings this species near to the Cherry-laurels. These racemes are at first erect, but after pollination they hang downwards. The fruit is small, roundish, black, and harshly bitter in taste, and encloses a round wrinkled stone.

The Gean (*P. Avium* L.) (in speaking of which it should, perhaps, be noted that there has in past times been an unfortunate confusion of the English and Latin forms of the name, Bird Cherry and *Prunus Avium* L., which ought to, but do not, belong to the same species) is a tree from twenty to thirty feet or more in height, and sometimes more than nine inches in diameter. It grows in dry, rocky woods, and yields a beautiful red timber, fine-grained, and tough enough for tool-handles, but once valued far more than at present by cabinet-makers, especially on the Continent. The leaves are drooping, and long-

stalked and downy on their under surfaces, and have two reddish glands on the stalk, and the flowers, which are produced somewhat later, are arranged in "umbels"—*i.e.* each on a rather long stalk springing with the others from one point, like the ribs of an umbrella. The petals are soft and limp, and are deeply notched. The fruit is heart-shaped, firm in flesh, and not very juicy, bitter in taste, and either black or red. The juice stains the hands. From it is distilled the kirschwasser of Germany, and it is probably the wild original of the Morello, or Brandy Cherry of our gardens.

The Dwarf Cherry (*P. Cerasus* L.) is a bushy shrub, not more than from three to eight feet in height, with a reddish bark, small blunt buds, and short-stalked, erect, and coarsely-notched leaves. Its flowers, too, are arranged in umbels, and have firm, slightly notched petals; and its fruit is round, red, and acid, being distinguished by this acidity and by the comparative abundance of its juice, which does not stain the fingers. It is believed to be the origin of our sweet garden Cherries; though, even if this be so, it does not militate against the statement that the latter are a late introduction from Asia, whilst the Dwarf Cherry grows wild over a large part of Europe. It does not extend north of Yorkshire.

"It is," says Professor Marshall Ward, "generally difficult, and sometimes extremely difficult, to determine the buds of the various species of *Prunus* and *Pyrus*. A good general distinction is found in the leaf-scars, which are usually narrow, crescentic and extended some distance round the twig in *Pyrus*, but

semilunate or nearly elliptical in *Prunus* and very slightly extended . . . and the exudations of gum so common in *Prunus* are not found in *Pyrus* and its allies."

Though we cannot look for any nice discrimination of merely specific characters in the early times in which most of our genuinely vernacular plant-names had their origin, it is remarkable that for so conspicuously beautiful a group of trees as the Cherries, with the exception of the Gean, all the common forms of the name are derivatives from the Latin *Cerasus*. No doubt the Romans first introduced the cultivation of the tree as an orchard fruit into Britain, and thus their name gave rise to the "Ceris beam" of the Anglo-Saxon, and the "Cherry" of our Normanised modern English; but, though we read of cherries being hawked in the streets of London in 1415, it is also said that in the "Dark Ages" this cultivation was lost, and that the tree was again introduced from Flanders in the time of Henry VIII. Certainly, though he can hardly be noted as referring to its cultivation, Shakespeare was perfectly familiar with the Cherry, the main ideas associated with it in his mind being, to judge from *A Midsummer Night's Dream*, the close resemblance of one fruit on the tree to another—as we say, "like two peas in a pod"—and the union in diversity of the two stalks that so often separate themselves from the rest of the umbel, each bearing its cherry, like sisters growing up together, or like two ruby lips inviting kisses.

What dweller in the country is ignorant of the charms of the wild Cherry? One of the early cheer-

BLOSSOM, FRUIT, AND LEAVES OF THE CHERRY.

fulnesses of spring is its array of light bronzy-brown leaves waving in May over a hedgerow yet black with the thorn-boughs of winter. To the true lover of Nature, who will be perforce also a careful observer of her ways, the delicate texture of spring leaves is as charming as is their colouring. Then among the brown-green leaves clusters of snowy blossoms make their appearance, giving a festival look to the whole wood-side, and long sprays of cherry-blossoms frequently wave aloft above the surrounding coppice, to send down, after a week or so of beauty, showers of light snow upon our heads as we gather the flowers beneath the trees.

Early gales, following summer drought, often strip the tree of its leaves before they lose their mature green colour; but if this is not so, there is indeed a treat in store for the sensuous lover of colour, as far surpassing that enjoyed by thrushes, blackbirds, and village schoolboys in the lusciousness of the ripe fruit, as his capacity for enjoyment is more keen than theirs. Tennyson described the Laburnum as

"Dropping-wells of fire";

but the autumn leaves of the Cherry far more closely resemble Pentecostal tongues of flame than do the clear yellow clusters of the favourite garden tree. The dark green shades into an infinite variety of pinks, crimsons, oranges, browns, and yellows, each little hanging leaf suggesting a piece of one of the magnificently-tinted leaves of the Muscat Grape.

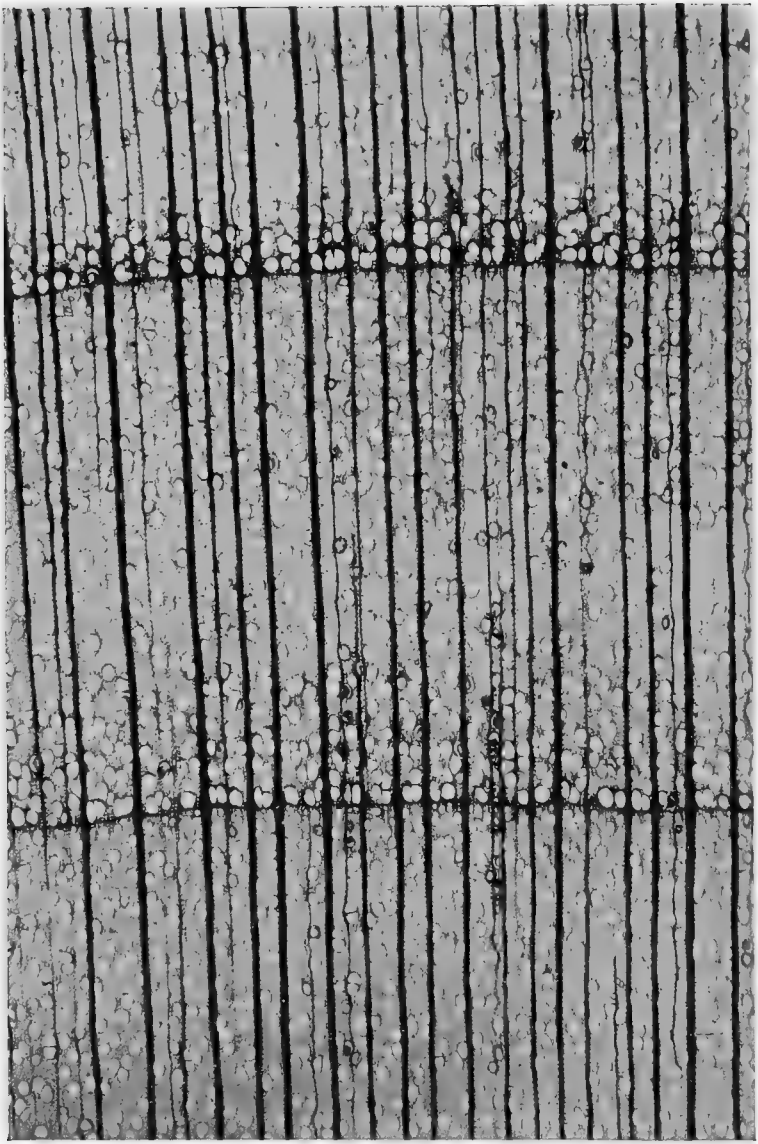
With so much beauty, and with valuable timber, it is strange that the Cherry should have attracted but slight attention from John Evelyn, the pioneer of

English forestry; but in his "Forest Trees," Selby does full justice to its merits. He points out that maraschino is manufactured from an allied species in Dalmatia and the north of Italy, and that it is also used in making ratafia; whilst he becomes quite enthusiastic on the subject of its timber. This close-grained red wood is, he says, so easily worked, and takes so fine a polish, as to be almost equal to mahogany, whilst for alternate exposure to dryness and moisture it is inferior only to the best Oak or Larch. It is, he states further, in request for the manufacture of certain musical instruments, and having formed a high opinion of its value as a forest tree, he urges its more extensive planting.

Referring, no doubt, mainly to the Gean (*P. Avium*), Selby points out that it will readily grow straight upwards if planted close together; and, being a fast-growing tree, it is therefore well adapted for planting as a "nurse" for Oak—that is, for admixture with the slower-growing, but longer-lived, timber-trees, to draw them up, being subsequently felled to make room for their further development. The Cherry, when grown under these circumstances, may, Selby continues, reach a height of sixty or seventy feet in fifty or sixty years; and, though it will then be felled, so that the forest monarch may, for the last half-century of his useful life, rule alone in his domain, up to that time, owing to the loose and ascending arrangement of its boughs, it will require but little pruning to let in the light upon the young Oaks under its sheltering care, so that it makes a better "nurse" than either Beech or Ash.

Photo : F. Mason Good, Winchfield

CHERRY.



TRANSVERSE SECTION OF CHERRY WOOD (X 30 DIAMETERS).

Their woods afford another means of discriminating between the *Drupa'ceæ* and the *Poma'ceæ*. The former have fine but visible pith-rays, and vessels so much more numerous in the spring-wood as to make a light-coloured pore-zone; whilst in the latter the pith-rays are not visible, and the vessels are evenly distributed throughout the annual ring.

Among the largest Cherry trees on record are those at Dunston, near Newcastle-on-Tyne, several of which are more than fifty feet high, while the two largest are seven and five feet respectively in circumference at a height of two feet from the ground. It is, perhaps, only under the favourable circumstances of good soil and the loving care of the cultivator that such exceptional dimensions can be attained; and certainly it is difficult to imagine anything more beautiful in its way than a Kentish Cherry-orchard, whether white with blossom, or blushing with glossy fruit or with turning autumn leaves. Still, as Mr. Ruskin eloquently argues in his "Modern Painters":—

"The Lowlander . . . even in his richest parks and avenues . . . cannot be said to have truly seen trees. For the resources of trees," he continues, "are not developed until they have difficulty to contend with; neither their tenderness of brotherly love and harmony till they are forced to choose their ways of various life where there is contracted room for them, talking to each other with their restrained branches. The various action of trees rooting themselves in inhospitable rocks, stooping to look into ravines, hiding from the search of glacier winds, reaching forth to the rays of rare sunshine, crowding down together to drink at sweetest streams, climbing hand in hand among the difficult slopes, opening in sudden dances round the mossy knolls, gathering into companies at rest among fragrant fields, gliding in grave procession over the heavenward ridges: nothing of this can be conceived among the unvexed and unvaried felicities of the Lowland forest; while to all these direct

sources of greater beauty are added, first the power of redundance—the mere quantity of foliage visible in the folds and on the promontories of a single Alp being greater than that of an entire Lowland landscape (unless a view from some cathedral tower); and to this charm of redundance, that of clearer visibility, tree after tree being constantly shown in successive height, one behind another, instead of the mere tops and flanks of masses, as in the plains; and the forms of multitudes of them continually defined against the clear sky, near and above, or against white clouds entangled among their branches, instead of being confused in dimness of distance."

Single trees look beautiful even in the hedgerows of our corn-fields, though their suckers may render them objectionable, from a utilitarian point of view, in such a situation as on a lawn. A better place, however, is in the thinly-planted woodland belt that skirts the home park; but, though several trees in the front line of such a belt will have a most pleasing effect, the best Lowland position is, perhaps, a slight clearing in a coppice, where the mass of flower-decked branches, waving over a carpet of spring blossoms, their pure white relieved with the bronze hue of the young leaves, comes as a charming surprise upon the beholder.

ASH.

THE ASH.

Frax'inus excel'sior L.

CALLED by Gilpin "the Venus of the woods," and said by Spenser to be "for nothing ill," the Ash is certainly one of the more important of our forest trees. It is truly native in Great Britain and throughout the greater part of Europe, whilst in North America it is represented by a closely allied species. Together with the Privets, Olives, Lilacs, and a few other genera, the Ashes form the small Order *Olea'ceæ*, a group of trees and shrubs with their leaves in opposite pairs, and with the parts of the flower in whorls of four or two, and generally united. The genus *Fraxinus*, to which the Ash belongs, consists of trees with deciduous foliage, with some at least of their flowers "imperfect," *i.e.* wanting either stamens or carpels, and with a winged fruit, or "samara." The etymology of the name *Fraxinus* is very uncertain.

Our common species, *F. excelsior*, was no doubt so called by Linnæus from its loftiness as compared with other members of the Order. Its distinctive characters are the absence of both calyx and corolla, and the "oblong-lanceolate" form and "serrate" margin of the leaflets, of which there are generally from nine to fifteen in each of the compound leaves.

There are frequent allusions to the Ash throughout European literature, since its tough saplings were naturally chosen by both Greeks and Romans for

their spears, whilst the agricultural writers of the latter nation recommend its wood for agricultural implements, a use to which it is still largely applied. In Scandinavian mythology the Ash plays a prominent part. "The primary characteristic of this old Northland mythology," says Carlyle, "I find to be impersonation of the visible workings of Nature. Earnest, simple recognition of the workings of Physical Nature, as a thing wholly miraculous, stupendous, and divine. What we now lecture of as Science, they wondered at, and fell down in awe before, as Religion. . . . All life is figured by them as a tree. Igdrasil, the Ash-tree of existence, has its roots deep down in the kingdoms of Hela, or Death; its trunk reaches up heaven high, spreads its boughs over the whole universe: it is the Tree of Existence. At the foot of it, in the Death kingdom, sit three Nornas (Fates)—the Past, Present, Future—watering its roots from the Sacred Well. Its boughs, with their buddings and disleafings—events, things suffered, things done, catastrophes—stretch through all lands and times. Is not every leaf of it a biography—every fibre there an act or word?"

According to the Edda, an eagle rests on the summit of this mystic tree to observe all that passes in the world, whilst a squirrel constantly ascends and descends to report those things that the eagle may not have seen. Serpents twine round its trunk, and from its roots flow two limpid streams—that of the knowledge of things past and that of the knowledge of things to come. Man himself was formed from the wood of this sacred tree.

Of traditions and superstitious associations with the Ash there is apparently no end. Evelyn and Gilbert White mention the still lingering practice of passing sickly children through a split made in its stem, as a charm against various disorders; and another practice was to bury a live shrew-mouse, which was supposed to bewitch cattle, in a hole in the stem, when a few strokes with the branch would cure the lameness or cramps which the mouse was believed to have caused. The decrepit remains of one of these shrew-ashes are still standing in Richmond Park. Many a rustic, probably, to this day believes that some dire calamity will befall the Crown or country in the year when there are no "locks and keys" on the Ash—a belief which may have only originated in the fact that probably in no year is the tree altogether without fruit, the fruit having for centuries been known in England as "keys" or "locks and keys." Popular weather-lore has various rhymes as to the probability of a wet or a dry season according as the Ash comes into leaf before or after the Oak; which, however, seem to be diametrically conflicting with one another in different counties.

The Ash attains a height of from thirty to fifty, or even from seventy to ninety feet, with a girth commonly of five or six, but in exceptional instances of as much as twenty feet. As the old ballad says:

> "The Oak, the Ash, and the Ivy tree—
> Oh, they flourished best at hame, in the North Countrie."

Here it is, as in the dales of Yorkshire, that we see it at its best, growing in moist situations in a rich loam.

If at all crowded it will form a trunk free from branches to a great height, but when standing alone it throws out large boughs, which divide into numerous branches so as to form a spreading head, whilst in old trees, especially when growing on rocky slopes, the branches acquire a downward sweep. Gilpin, in his "Forest Scenery," gives a characteristic description of the spray of the Ash:—

"As the boughs of the Ash are less complex than those of the Oak, so is its spray. Instead of the thick intermingled bushiness which the spray of the Oak exhibits, that of the Ash is much more simple, running in a kind of irregular parallels. The main stem holds its course, forming at the same time a beautiful sweep; but the spray does not divide, like that of the Oak, from the extremity of the last year's shoot, but springs from the sides of it. Two shoots spring out opposite each other, and each pair in a contrary direction. Rarely, however, do both the shoots of either side come to maturity; one of them is commonly lost as the tree increases, or, at least, makes no appearance in comparison with the other which takes the lead. So that, notwithstanding this natural regularity of growth (so injurious to the picturesque beauty of the Spruce Fir and some other trees), the Ash never contracts the least disgusting formality from it. It may even receive great picturesque beauty, for sometimes the old branch is lost as far as one of the lateral shoots, and this occasions a kind of rectangular junction, which forms a beautiful contrast with the other spray, and displays an elegant mode of hanging to the branches of the tree. This points out another difference between the spray of the Oak and that of the Ash. The spray of the Oak seldom shoots from the under sides of the branches, and it is this chiefly which keeps the branches in a horizontal form. But the spray of the Ash, often breaking out on the under side of the branch, forms very elegant pendent boughs."

The smooth ashen-grey bark of the bole has been supposed to be the origin of the name Ash. The twigs are slightly greener, and are noticeably flattened at

FOLIAGE, FLOWERS, AND FRUIT OF THE ASH.

each node whence spring the prominent bases that support the heavy leaves, and that are afterwards marked by the large scars.

The short oval, black buds in the leaf-axils which distinguish our Ash from its American congener (*F. america'na* Willd.), in which they are a greenish white, attracted the attention of Tennyson, as, in "The Gardener's Daughter," he describes Juliet's hair as

> "More black than ash-buds in the front of March."

He also notes how

> "The tender Ash delays
> To clothe herself when all the woods are green."

Often, in fact, this species is not in full leaf until June, though in exceptional seasons, such as 1840 and 1848, leaves may appear in the first week in May. Before the gracefully-cut foliage has, however, begun to burst from the black bud-scales, rich vinous clusters appear in the axils of the branches. These are the panicles of simple flowers, consisting mostly of purple-black anthers, but also bearing simple flask-shaped ovaries, surmounted by a two-forked stigma. *F. Ornus* L., the so-called "Flowering Ash," or "Manna Ash" has a corolla of four white petals, differing from those of the allied genera, the Privets and the Lilacs, in being but very slightly united at the base. In the Common Ash, however, in which there is neither corolla nor calyx, the flowers are what is technically known as "polygamous," *i.e.* some branches of the inflorescence bear stamens only, others only ovaries, and others again bear both. Some Ash

trees are, however, exclusively male or exclusively female.

Like most of those trees which, from their flowering before the bursting of their leaf-buds, are termed "precocious," the Ash is probably often cross-fertilised by the wind. Its flowers appear in April and May. It is in June and July, however, that "the Venus of the woods" appears draped in her full beauty of gracefulness. Then the pinnate leaves, each consisting of from four to seven pairs of gracefully-tapered leaflets, arranged at some little distance apart along the mid-rib and at the end of a short leaf-stalk, give a light feathery grace to the whole tree. It may be merely rounded in outline or drawn up to some height, and the green of the foliage is somewhat dull and monotonous when viewed closely; but it is the transparency of the tree, and the play of light through its entire leafage, that give its chief charm to the Ash. Much of this airy lightness is lost in the weeping variety, as the foliage then hangs downwards like the dank green locks of some river naiad; but like all pendulous trees, this form looks well by the water.

The leaves, with their lance-shaped outlines and toothed margins, are no less remarkable for their early fall in autumn than for their late arrival in spring. They often turn to a clear lemon-yellow before they fall, but as each leaf does so separately the tree is not among our more prominent autumn beauties.

The long and narrow strap-shaped fruits, or "keys," hang in dense drooping clusters; from a glossy sap-green they become gradually streaked with

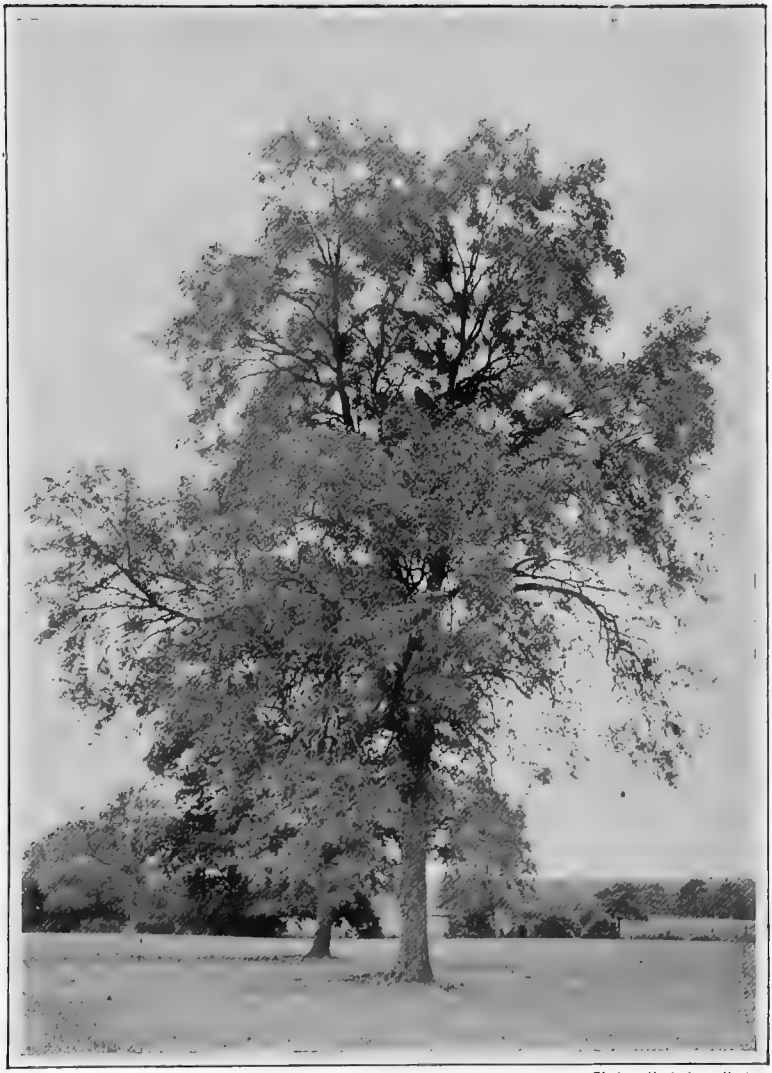
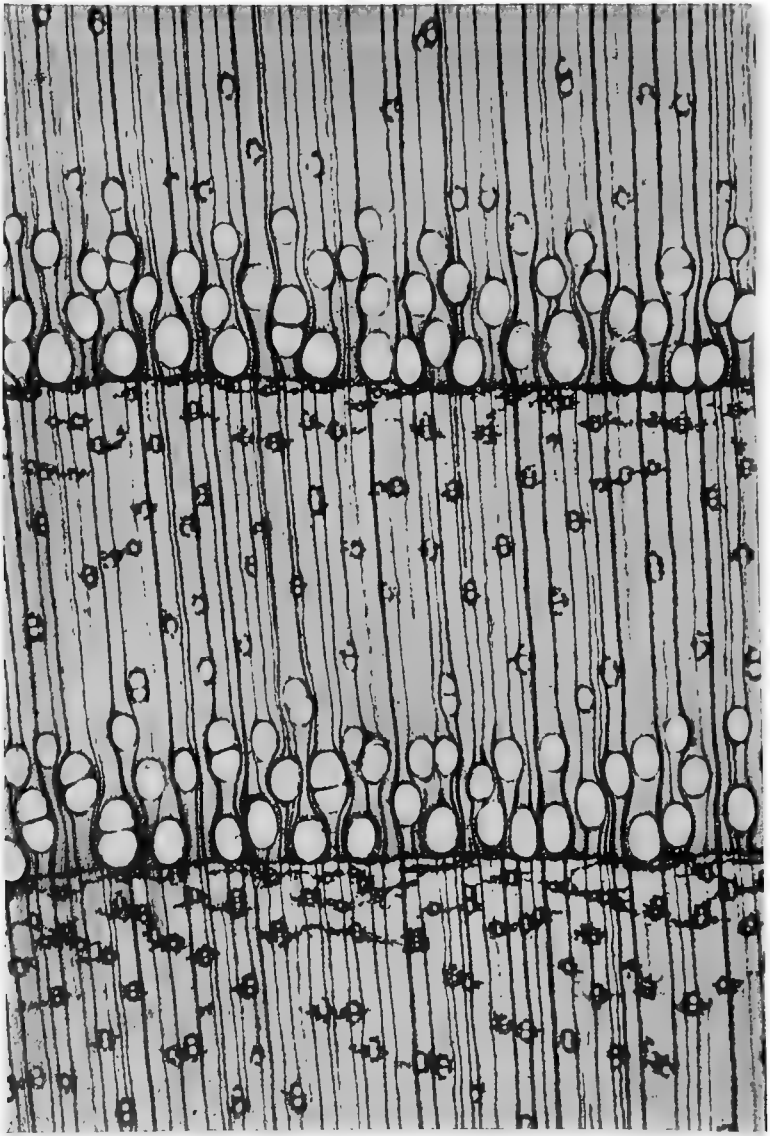


Photo : H. Irving, Horley.

ASH.



TRANSVERSE SECTION OF ASH WOOD (X 30 DIAMETERS).

a blackish hue, which then colours them entirely until they follow the falling leaves. Evelyn tells us that they were formerly picked when green and pickled with salt and vinegar "as a delicate salading." Their form no doubt assists in the dispersal of the seed away from the parent shade when the wind detaches it from the bare boughs, and it may also aid in burying it beneath the ground as it certainly facilitates the introduction of Ash seeds into crevices in rocks, in ruined walls, or in clefts of other trees.

Few trees do more harm to vegetation beneath their shade than does the Ash, from its dense mass of roots sent out horizontally but a little beneath the surface. It is, therefore, most obnoxious to the farmer in the hedgerows of his arable land. It does not, however, absolutely kill grass growing beneath it, so it might often be planted as an ornamental tree on the lawn.

Of individual trees, undoubtedly the most remarkable is that at Woburn Abbey, 90 feet high, with a stem 28 feet high, more than 23 feet round at its base and 15 feet at 3 feet from the ground, with branches spreading 113 feet, and containing timber estimated at 872 cubic feet.

The wood of the Ash is a greyish-white throughout, the broad sap-wood being used along with the more central portions, an advantage peculiar to but few species. It is tougher and more flexible than that of any other European tree, and its value is increased by rapid growth. Few trees become useful so soon, it being fit for walking-sticks at four years' growth, for spade-handles at nine, and when three

inches in diameter it is as valuable as the timber of the largest tree. In the Potteries it is largely used for crate-making, and in Kent for hop-poles. Both the spokes and the felloes of wheels, carriage-poles and oars are made from it, and from its flexibility it is in fact "the husbandman's tree" for every kind of agricultural implement. The tree lives to an age of several centuries, but can be most profitably felled at from eighty to a hundred years old. For smaller wood it is, of course, largely treated as coppice, being then known as "Ground Ash."

The timber, when beginning to decay, becomes stained of a blackish hue at the heart, and the young shoots, like those of the holly, are very liable to the malformation known as "fasciation"—"the wreathed fascia" of the older writers—in which several branches grow together in a flattened and often spirally twisted form.

Few trees are less particular as to soil and situation than the Ash. It grows at altitudes of 1,350 feet in Yorkshire, and up to 4,000 feet in the Alps, but for perfect development it requires shelter; it loves a deep loamy soil; and, though it will grow fast in such a soil if constantly moist, old and sound timber is the product of well-drained, almost dry ground.

GUELDER-ROSE.

THE GUELDER-ROSE.

Vibur'num Op'ulus L.

THOUGH necessarily both possessing those structural characters of flower and fruit which indicate to the botanist a generic identity, two trees in one genus are in few cases so unlike to the general observer as are the Guelder-rose and the Wayfaring-tree (p. 89). Not only do they differ in general habit of growth, in the forms of their leaves, and in the appearance of their flower-clusters; but even in such minutiæ as the formation of their bark and the arrangement of their buds they present characters widely at variance. The one rigid, the other graceful; the former densely pubescent, the latter smooth in surface; the Wayfaring-tree with unlobed leaf, naked buds, and all its flowers alike, whilst the Guelder-rose has a divided leaf that has provoked comparisons with various other types, and some of its flowers are so conspicuously modified as to distinguish it at once from all other native trees and shrubs.

In attempting an explanation of some of these differences, Lord Avebury has called attention to the geographical distribution of the two species Whilst the whole Order *Caprifolia'ceæ* belongs mainly to the temperate regions of the Northern Hemisphere, the genus *Viburnum*, comprising, as it does, more species than any other genus in the Order, extends to the Andes and into other sub-tropical regions. *Viburnum*

Lanta'na and *V. Opulus* are, Lord Avebury points out, "among the northern representatives of the genus"; and, although he merely alludes to this fact as a general explanation of the dense felt of hairs on the naked buds of the one species and of the presence of leathery bud-scales and stipules in the other, it may not be insisting too much upon evidence of this character to point out that whilst the Wayfaring-tree, the species with naked buds, does not occur north of York in Britain, or of Belgium on the mainland of Europe, the Guelder-rose, the species with more obviously protected buds, extends throughout Scotland and into Scandinavia.

This species, for which, from among a long list of popular names, we prefer that of Guelder-rose, is a straggling shrub or small tree, from six to twelve feet high when in a wild state, but a little taller when under cultivation, seldom having a single stem of any height, and ill adapted to stand alone on lawn or in garden. Scrambling in a large hedge or among other bushes in a shrubbery, or—better still—overhanging a pool or stream, it presents a series of charms which have, in fact, endangered its continued existence in many districts. Its long, slender, smooth, green branches in such waterside situations often bend in autumn beneath the weight of the ripening fruit, though a few weeks earlier they have gaily held aloft their attractive clusters of blossom. The twigs are round, or have but slight traces of four angles towards their apices; they have the smooth polished surface so characteristic of the whole plant, and so unlike its congener, the Wayfaring-tree; and they are

of a pale brown or yellowish colour. Whilst the Wayfaring-tree shares with Roses and Willows the somewhat uncommon characteristic of originating its "periderm," or corky secondary bark, in its outermost or epidermal layer of cells, in the Guelder-rose the more usual method, the origin, that is, of the periderm in the "hypoderm," or layer next below the epidermis, obtains. The cork-warts or lenticels, the points at which this formation of periderm originates, are few and small.

The terminal buds of the shoots are generally aborted, their place being taken by two small slightly-stalked egg-shaped lateral ones. These are smooth and reddish-brown, with a slight stickiness, and each is enclosed by two leathery scales fused together at their bases. Three or five veins can be traced on the inner surface of each of these outer scales, as in a leaf-stalk, and three of them generally end in the glandular tips which excrete the viscid secretion just alluded to. When this pair of scales bursts open it discloses a second pair, pale green, more membranous in texture than the outer pair, five-veined, and also cohering in a tube below. Within these come the true leaves, which are downy when young, but become perfectly smooth on their upper surfaces later. They are thin and tender in texture, and of a vivid green, and are broad and palmately three-lobed, the lobes being large, triangular, and coarsely and irregularly toothed. The base of the leaf-blade is heart-shaped, and at the top of the short leaf-stalk there are two or more sessile honey-glands, often of a reddish colour. On either side of the base of the leaf-stalk is

a narrow green adherent stipule and a stalked gland. In the presence of bud-scales, of honey-glands, and of stipules to all the leaves, in texture, surface, colour, and lobing, this species presents a marked contrast to the Wayfaring-tree. Lord Avebury points out that stipules are the exception in the Order *Caprifoliaceæ*, the Elder, and a few species of *Viburnum*, being almost the only cases in which they are found. In the majority of species of *Viburnum* the leaves are unlobed and have no stipules: in the few that are lobed, like the Guelder-rose, stipules are always present, which obviously suggests a causal relationship between lobes and stipules. When leaves are enclosed in leathery bud-scales it is, Lord Avebury points out, advantageous that the true leaves should be so folded as to occupy less space, whilst he suggests that the lobing of the leaf is a direct mechanical result of this folding, and that the stipules are themselves a further result of similar causes. "A leaf folded up as are those of *V. Opulus*, requires," he says, "only two or three lateral veins. The remaining veins, then, and the membrane connecting them, will gradually be reduced, and ultimately disappear."

This is merely an application of a principle known as the law of economy of nutrition, which has been recognised from the time of Aristotle, and of which we shall have something more to say presently in another connection. The bases of the leaf-stalks in the bud of the Guelder-rose are not dilated as are those of the Wayfaring-tree, and there is accordingly a space between them. This is usefully occupied by the stipules. Thus scales and folding more than

FLOWERS, FRUIT, AND FOLIAGE OF THE GUELDER-ROSE.

effectually replace the felted hairs of the Wayfaring-tree, and the lobing of the leaf is the result of this folding.

The honey-glands, according to Lord Avebury, serve as an attraction to ants and wasps, which act as a bodyguard to protect the tender young leaves, destitute as they are of felted hairs, from caterpillars and other insects.

Professor Marshall Ward suggests that the pointed lobes of this and similar leaves may act as "drip-tips," enabling the leaf speedily to run off superfluous water which might otherwise clog the transpiratory system.

Towards the end of May or early in June the stronger shoots are terminated with the opening clusters of blossom. Their branching is complex, but may be termed a "corymbose cyme" in that the flowers towards the centre are the first to open, and the greater length of the stalks to the outer ones brings them all more or less to a level. As we shall see in Service-trees and Dogwood, or as we may see in most *Umbellif'erœ* and in the Elder, this massing together of small blossoms individually inconspicuous is a method by which Nature frequently obtains that conspicuousness which is desirable to attract cross-pollinating insects. In the Guelder-rose, however, this object is still more completely attained by an additional adaptation unique among British trees. The outer blossoms of each cluster have their white corollas nearly an inch across, or four times the size of the inner ones. "But," says Aristotle, "Nature cannot distribute excess simultaneously in many

directions," a truth expressed by Geoffroy St. Hilaire and Goethe as the law of balancement of growth: "in order to spend on one side," says Goethe, "Nature is forced to economise on the other." Accordingly, as in the Hydrangea of our gardens, or the blue outer florets in the Cornflower, these large outer flowers in the Wild Guelder-rose are neuter, having, that is, neither stamens nor carpels, and are able to throw so much the more energy into the production of their corollas.

It is here that the cultivated variety, to which the name Guelder-rose properly belongs, differs from its wild original, all its flowers, and not only the outer ones, being neuter. The variety is known, therefore, technically as *ster'ilis* and produces no fruit, being, of course, only propagated by cuttings or grafts. The crowding of its large corollas converts the inflorescence into a perfect ball, to which it owes its common name of Snowball-tree, with its equivalents in French, *Boule de Neige* and *Pellotte de Neige*, and in German, *Schneeballe*, together with the Devonshire May Tosty and Tisty-tosty and the now somewhat generally familiar Whitsuntide Bosses. As in the wild tree honey and perfume are confined to the central fertile flowers, this garden form is scentless, a fact to which Cowper alludes in "The Task" when, describing the beauties of this gay season, with Lilac and Jasmine, he writes of

> "The scentless and the scented rose; this red,
> And of an humbler growth, the other tall,
> And throwing up into the darkest gloom
> Of neighbouring cypress, or more sable yew,
> Her silver globes, light as the foamy surf
> That the wind severs from the broken wave."

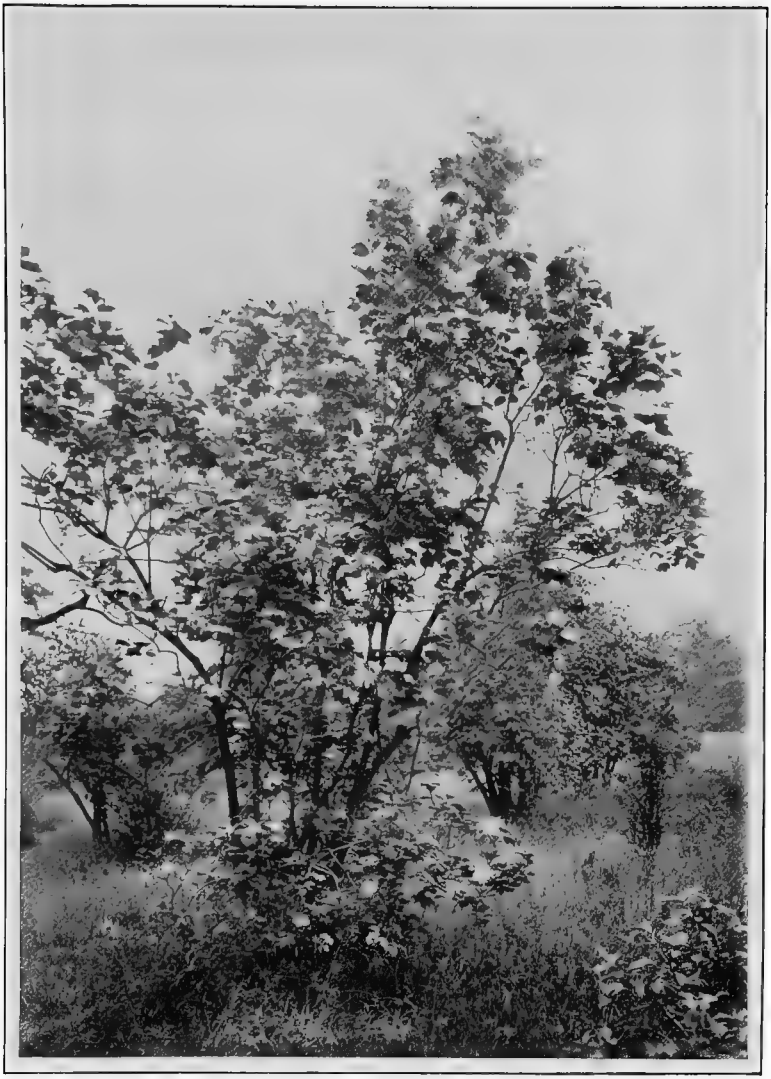
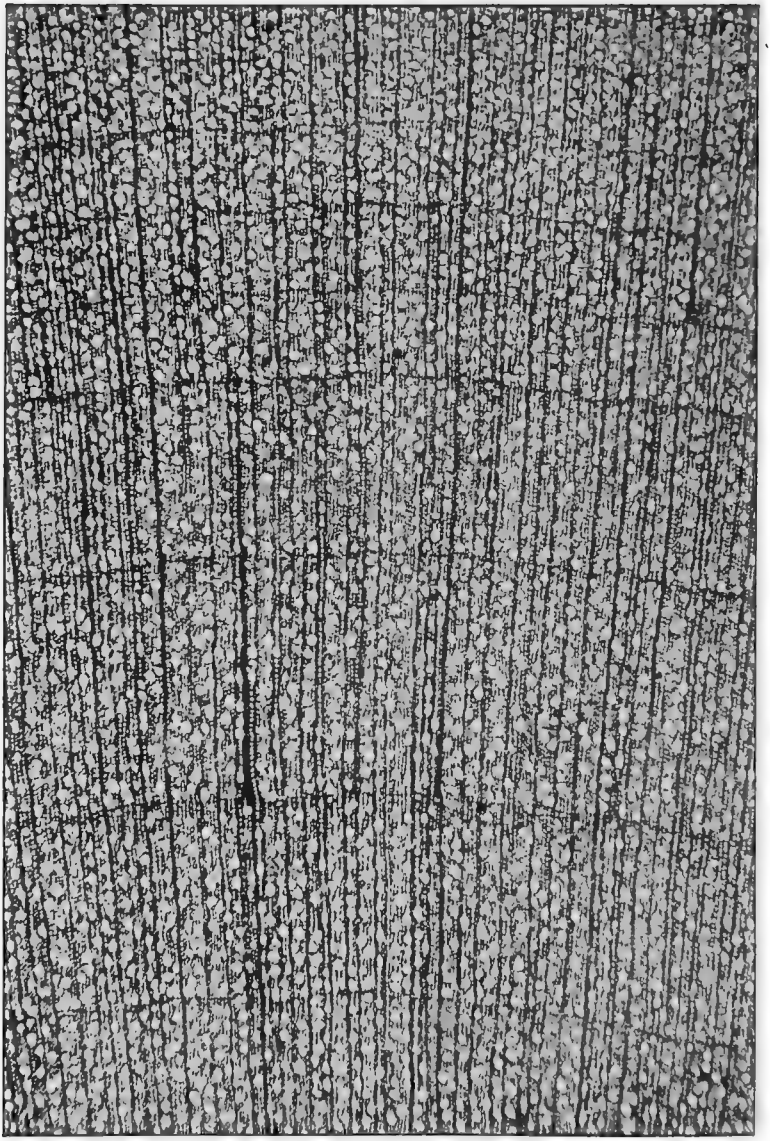


Photo : H. Irving, Horley.

GUELDER-ROSE.



TRANSVERSE SECTION OF WOOD OF THE GUELDER-ROSE (X 30 DIAMETERS).

When in flower its leaves are still of a bright clear green that enhances the purity of the snowy inflorescence, and in many a suburban garden affords a pleasing contrast with the dark vinous hue of the Copper Beech or the clusters of the pink May. The wild form, too, by many a stream and in many a moist hedgerow, exhibits the beauty of perfect vitality —a charm free from the saddening suggestions of autumn, whose splendours are but the immediate forerunners of decay. By July the leaves have lost their freshness, and the blossoms have, in the wild form, given place to inconspicuous clusters of loosely-grouped green berries of an oval outline; but in August these latter begin to turn in colour, reddening to a pure and limpid crimson like drops of transparent blood or rubies from the trees in the garden of Aladdin. This is an autumnal glory denied to the sterile variety; but in October the leaves of wild and cultivated form alike glow with an added charm: a blush of rosy pink suffuses the margin of a leaf, spreads to the centre or from lobe to lobe, deepens to a rich claret colour, and may fade at its edges to a golden yellow. We are not surprised that we have seen the beautiful flower-clusters of the Wild Guelder-rose hawked in London streets in June, its jewel-like berries offered for sale in September, and its rose-coloured leaves in the same market in October; but it will be difficult for the hedgerows to sustain for long this triple tax of a huge metropolis with a growing sense of the beautiful.

Per contra, the green wood and the decaying fruit have such an unpleasantly fetid odour that the tree

is known in the Isle of Wight as Stink-tree. Nevertheless, the juicy, tempting-looking berries are mixed with honey and flour and eaten in Siberia and in Scandinavia, as well as distilled for spirit.

The toughness of its even-grained wood and its long flexible shoots have led to its use for weavers' combs, shoe-pegs, whip-switches, and the stems of tobacco-pipes, and to its sharing with *Cornus* and *Euon'ymus* such names as Dogwood, Gatten, Gadrise, Gatteridge, and Whipcrop. Its stems are imported from South-Eastern Europe under the names of Teazle or Balkan Rose for walking-sticks and umbrella-handles. Being, however, a less familiar tree than the Elder, which it somewhat resembles in its blossoms, and the Rowan, to which it may be compared when in fruit, it has acquired the names of Dog-eller, Red (that is, red-fruited) Elder, and Dog-rowan, "dog" as a prefix constantly in plant-names signifying merely "spurious." The general likeness to the Elder seems to have attracted the attention of botanists at a somewhat early date; and such names as Water Elder and Marsh Elder have long been applied to it in English, and the equivalent *Wasserholder* in German.

William Turner did not know this as an English tree, and speaks of it under what is now its specific name—*Op'ulus*, which seems to be a curious mediæval variant of *Pop'ulus*. In his "Names of Herbes" (1548), he writes: "Opulus is a tree commune in Italy and Germany, but I have not sene it that I remembre in Englande. It is called in frenche as Gesnere sayeth opier, and so maye it be also called in englishe tyl we fynde a better name."

WALNUT.

THE WALNUT.

Ju'glans re'gia L.

At the first glance we seem in the name Walnut to have an etymological solecism. Whilst, however, the Wall-flower is a flower that grows commonly on walls, the Walnut (a name practically identical with that borne by the tree in Germany) is the Welsh, foreign, or Italian nut, the Italians being to the Germans of the Continent the foreign neighbours that the Britons of Wales were to our English ancestors.

The Walnut was so valued by the Romans, both as yielding a furniture wood and as a fruit-bearing tree, that they probably introduced it both into Germany and into Britain; but it is not a native of Italy. Its original home seems to have been the north of Persia, and its Greek names, "Persicon" and "Basilicon," indicate this origin and the esteem in which it was held. From the latter name is derived its specific name of "regia" or royal. According to Pliny, the tree was also called "Caryon" (the origin of the name *Ca'rya*, the Hickory), from the drowsy feeling in the head produced by the smell of its leaves; but possibly this name may be due, as Cowley suggests, to the resemblance of the kernel to the form of the brain.

The Walnut is said to have been one of the

antidotes employed by Mithridates King of Pontus; and the bitter principle so abundant in the plant—especially in the leaves, the unripe husk or "pericarp" of the fruit, and the brown skin or "testa" of the seed—has rendered it universally popular as a vermifuge. Similarly, a decoction of the leaves was used by anglers to water the ground, so as to make worms come to the surface.

Introduced into Italy before the Christian era, it was named *Juglans*, "Jove's acorn," and was looked upon as sacred to Diana, whose festivals were held beneath its shade. This seems to have been the origin of the custom of scattering walnuts at weddings.

The Walnut belongs to a small Order of trees and shrubs known as *Juglan'deæ*, comprising only five genera and about thirty species, which are mostly natives of North America. The Order is characterised by its aromatic leaves, which are exstipulate, alternate, and pinnately compound; by having staminate and pistillate flowers in separate catkins on the same tree; by an ovary formed from two or four carpels, but one-chambered, surmounted by the perianth, and containing a single erect and unbent ovule, and by the fleshy fruit, containing a hard "nut" or "endocarp," and a seed with oily cotyledons.

The Walnut is one of the largest trees in the Order, growing rapidly so as to reach a height of twenty feet in ten years, when it begins to bear fruit; and ultimately not unfrequently attaining a height of between sixty and seventy feet, with a

trunk five feet or more in diameter, and large limbs spreading thirty or forty feet from the stem. When young it is liable in our climate to injury by spring frosts; but it increases in productiveness up to a great age, one at Melbury Park, Dorsetshire, being stated to be two hundred years old. It is not particular as to soil, so long as it has good drainage, sending down strong tap-roots even into clefts of rock, and so securing an exceptionally firm hold of the soil. Evelyn considered, however, that the Walnut did best upon the Chalk, where, as at Carshalton, Leatherhead, and Marden Park in Surrey, there were, in his time, "considerable plantations of this tree," which, with most of those in other parts of the kingdom, were converted into gun-stocks during the war with Napoleon.

This manufacture is still one of the main uses of the wood of this and of allied species, it being found lighter in proportion to its strength and elasticity than any other timber; but it is also used for pianofortes, furniture, and turnery generally. In young trees the wood is white and liable to be worm-eaten; but as the tree becomes older it is compact, brown, and beautifully veined, though still easy to work. Walnut is undoubtedly the most beautiful furniture-wood of Europe, and at the beginning of the eighteenth century, before the general introduction of Mahogany, was very fashionable. Swiss carvings are largely executed in Walnut. For density and beauty of marking, that obtained from trees grown on poor soil is the best; but the most beautiful veinings are in the roots,

which can, however, seldom be procured of a size large enough for any but small articles.

Burrs or excrescences are common on the stems of the Walnut in Italy and in the Caucasus, frequently measuring two or three feet across and twelve or fifteen inches thick, and weighing five or six hundredweight. These are often so prettily mottled as to sell for as much as fifty or sixty pounds a ton, for veneering. The Italian wood is considered the best, that of *Juglans ni'gra* L., the Black American Walnut, being inferior both to it and to that from the Black Sea.

The bark is thick and deeply furrowed on the trunk, but smooth and grey on the younger branches. As the Walnut generally forms its young shoots in April and May, and does not, like the Oak, remain in an actively vegetative condition all through the summer, until surprised perchance by early autumn frosts, its symmetry of outline is seldom damaged by wind or cold. One of the most distinctive structural features of this tree is the pith of the young shoots, which, as can readily be seen on cutting a branch across, is divided up in the process of growth into a succession of thin discs with hollow spaces between them.

The tree generally comes into leaf and flower in April; but there are both early and late varieties in cultivation. Of these, the former is known as "Noyer Mésange," in the south of France, having so thin a shell to the seed that it is commonly pierced by tom-tits (Gallicé, *mésange*). It was no doubt to the late variety that the so-called

WALNUT FRUIT AND LEAVES.

miraculous Walnut-tree of Glastonbury belonged. It grew in the Abbey yard, on the north side of St. Joseph's chapel, and is stated to have never budded until the feast of St. Barnabas, June 11th, but to have always burst into leaf on that day. This variety, however, ripens its fruit almost as early as the other kinds.

The leaves consist of from five to nine leaflets, that is, of two, three, or four pairs and one terminal one; the whole often exceeding a foot in length. The apical leaflets are generally the larger, and they have all an oval outline with a somewhat produced point, and a very slightly notched or serrate margin. The leaves are perfectly smooth, though not possessing the lustrous gloss of those of the Spanish Chestnut. They are of a peculiar shade of green with a good deal of yellow in it, which makes a pleasingly cheerful contrast with the foliage of most other trees. In hot weather, or when bruised, they give out a powerful aromatic smell which is said to produce drowsiness or even nausea. Like the roots, the young bark, and the unripe husk of the fruit, the leaves contain astringent matter producing a dark brown dye, which does not require mordants. This dye—which is used by gipsies to stain the skin, and by cabinet-makers to make lighter woods resemble Walnut—can be removed from the fingers, when unintentionally applied, by means of salt.

The pendulous male, or staminate, catkins are produced singly from the apex of leafless shoots of the previous years, this being one of the main

points of distinction between the genus *Juglans* and the Hickories (*Carya*), in which three catkins are produced from a shoot, formed during the same year, that also bears female flowers and leaves. The cylindrical catkin of the Walnut, which is about three inches long and three-quarters of an inch in diameter, bears a great number of closely-packed and minute flowers of a simple structure. They each have a short stalk, an adherent bract, two lateral bracteoles, and a perianth of six leaves, enclosing an indefinite number of nearly sessile stamens.

The female flowers are borne in a cluster of four to eight at the apex of the leafy shoots of the same year. They each have an adherent perianth of four leaves in two pairs, besides their bracteoles, and the twofold nature of the fruit is indicated by the relatively large, fleshy stigmas.

The fruit of the Walnuts and Hickories is unlike that of any other group. It has a fleshy, green outer husk or "epicarp," which in the former bursts, when ripe, irregularly, and within this is a woody, two-valved stone or "endocarp," which is produced internally into a membranous partition, deeply dividing and crumpling the fleshy cotyledons of the kernel or seed. This seed is enveloped in a bitter brown testa, and a more delicate cream-coloured inner coat, and its primary root and shoot can be detected near its centre.

Walnuts have long been preserved, either whole, when unripe, or the kernels only, as sweetmeats; but with us the young fruits are more used as a

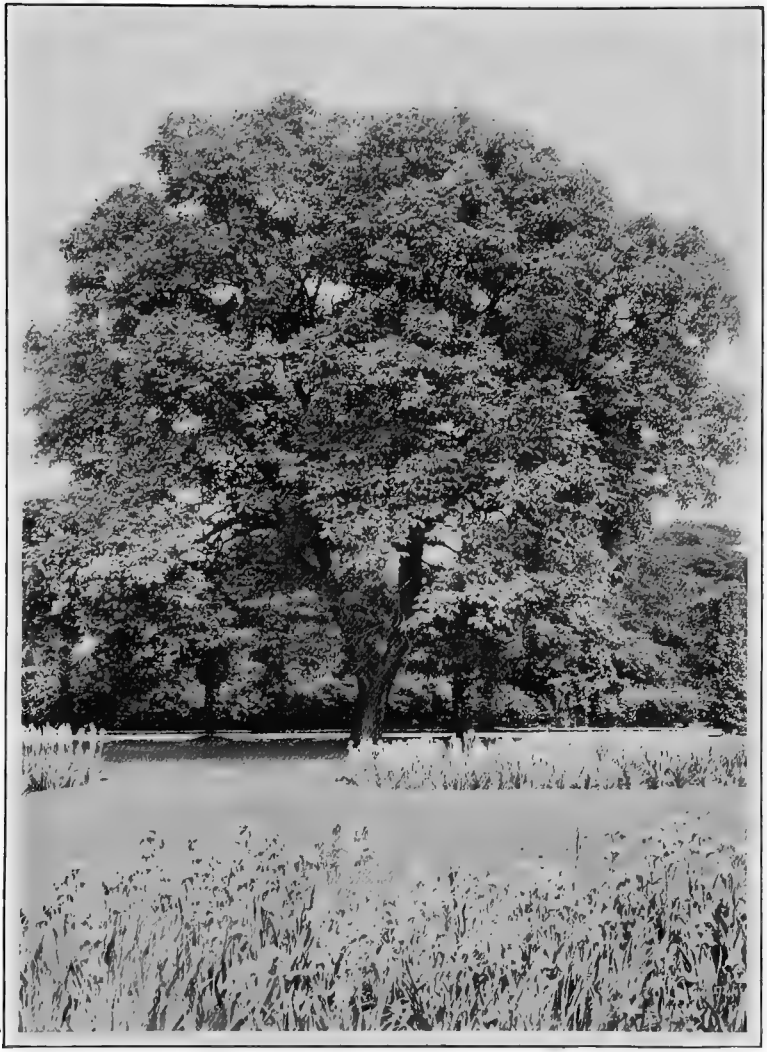
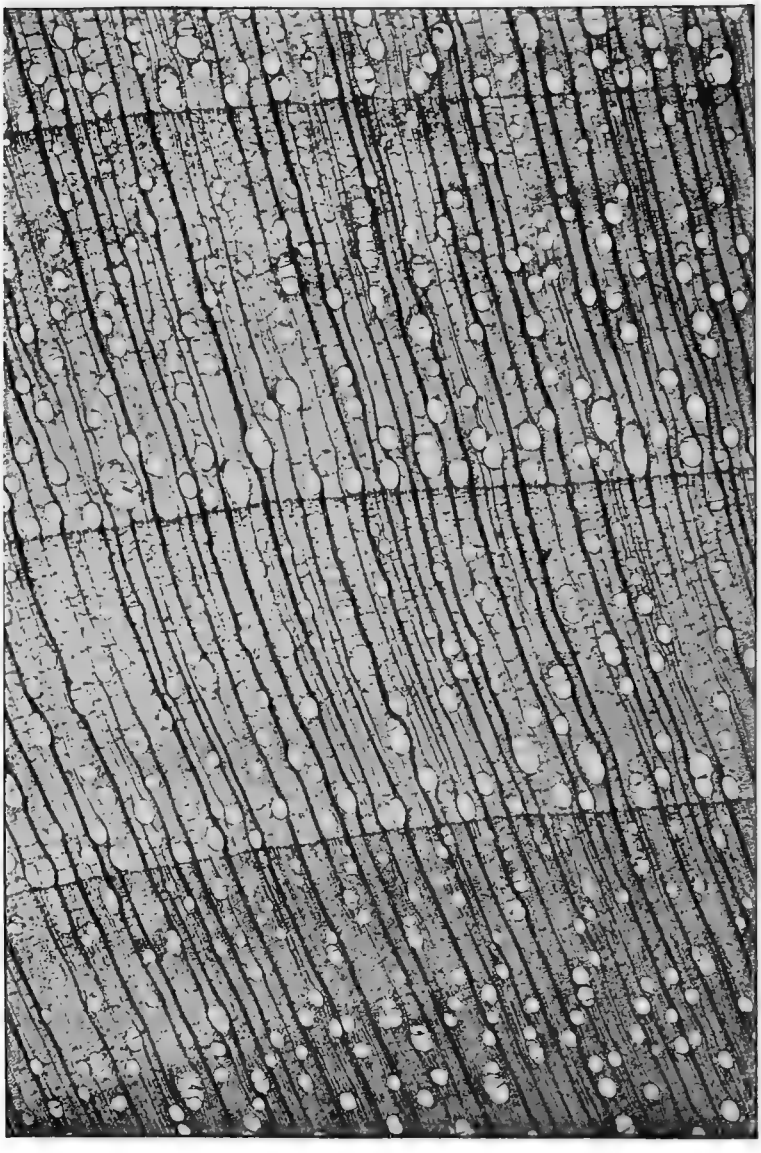


Photo : E. J. Wallis, Kew.

WALNUT.



TRANSVERSE SECTION OF WALNUT WOOD (X 30 DIAMETERS)

pickle, whilst the ripe nuts, which are not indigestible so long as they will peel, are largely eaten as an autumn and winter dessert fruit. In the south of Europe the oil is largely expressed from the kernels and used by artists for mixing with delicate colours, for lamps, as a substitute for olive oil, and apparently as a hair-wash, whilst the residual oil-cake is a valuable food for sheep, pigs, or poultry. A bushel of walnuts will yield fifteen pounds of kernels, and these give up half their weight as oil.

To collect the fruit, which ripens early in October, the ends of the branches are commonly thrashed with long poles. This breaks off many of their points, and so causes the production of new spurs, which will probably bear female, *i.e.* fruit-bearing, flowers. This thrashing, the improving effect of which is also applied in the proverb to wives and dogs, is therefore also practised in the case of barren trees to make them bear.

As grass and other plants will not grow well under Walnut-trees, they are commonly banished to hedgerows, road-sides, and odd corners; and though, as the tree does not possess any very distinctive beauties, it has not received much notice from the poets, this fact, with its other wrongs and many virtues, is fully recorded by Cowley in the following verses:—

> "The Walnut then approached, more large and tall
> Her fruit which we a nut, the gods an acorn call:
> Jove's acorn, which does no small praise confess,
> T've called it man's ambrosia had been less;

Nor can this head-like nut, shaped like the brain
Within, be said that form by chance to gain,
Or Caryon called by learned Greeks in vain;
For membranes soft as silk her kernel bind,
Whereof the inmost is of tenderest kind,
Like those which on the brain of man we find.
All which are in a seam-joined shell enclosed,
Which of this brain the skull may be supposed.
This very skull enveloped is again
In a green coat, her pericranium.
Lastly, that no objection may remain
To thwart her near alliance with the brain,
She nourishes the hair, remembering how
Herself deform'd without her leaves does show;
On barren scalps she makes fresh honours grow.
Her timber is for various uses good;
The carver she supplies with useful wood,
She makes the painter's fading colours last,
A table she affords us, and repast;
E'en while we feast, her oil our lamp supplies;
The rankest poison by her virtues dies,
The mad dog's foam, and taint of raging skies.
The Pontic king, who lived where poisons grew,
Skilful in antidotes, her virtue knew.
Yet envious fates, that still with merit strive,
And man, ungrateful, from the orchard drive
This sovereign plant; excluded from the field,
Unless some useless nook a station yield,
Defenceless in the common road she stands,
Exposed to restless war of vulgar hands;
By neighbouring clowns and passing rabble torn,
Batter'd with stones by boys, and left forlorn."

WAYFARING-TREE

THE WAYFARING-TREE.

Viburn'um Lanta'na L.

WHILST in the majority of our familiar trees which have showy blossoms, in Horse-chestnut, Laburnum, Cherries, Apple, Hawthorn, and Rowan for example, the petals are distinct, as is readily seen when they fall one by one, the Order *Caprifolia'ceæ*, the Honeysuckle Family, upon the consideration of which we are now entering, is on the other hand a member of the series known as *Sympet'alæ* or *Gamopet'alæ*, from the fact that all the petals, or segments of the corolla, are united below into a longer or shorter tube, so that, as is familiarly the case with Elder-blossom, they all fall off in one piece.

The Honeysuckle Family is not a large one, though it includes forms which are so dissimilar, at least superficially, that their affinity would hardly be guessed or appreciated by any but those with a knowledge of botany.

The Honeysuckle, the Elder, the Snow-berry tree, and the Laurustinus do not, at first sight, seem to have much in common. Most members of the Order are woody plants: their leaves are given off in opposite pairs, those at each successive node of the stem crossing the pair below at right angles, or "decussately," so that all the leaves fall into four vertical rows. The fruit is generally fleshy; and

they are mostly natives of the temperate regions of the northern hemisphere.

Among truly British plants there are but seven species in this Order, belonging to five different genera. The beautiful woody climber that gives its name to the group can hardly be termed even a shrub; but its spirally twining stems with their bark coming away in longitudinal strips are familiar objects to the woodlander as they strangle the young stems of the Hazel underwood. Its long tubular blossoms, so uniquely divided into two unequal recurved lobes, made up, the one of four petals and the other of a single one, are remarkably unlike the symmetrical, and generally small, five-pointed, star-like, white corollas of most of the other members of the Family, such as the Guelder-roses and the Elders.

The genus *Viburnum* comprises about a hundred species, or nearly a half of the Order. Few of them can truly be dignified with the name of trees, though all are woody. Their leaves are stalked and simple, though sometimes lobed, and their flowers are symmetrical, white or tinged with pink, and grouped in clusters, generally flat-topped. This symmetrical form of corolla of five petals united below in a short tube is somewhat inadequately termed "rotate," or wheel-shaped, in technical language: "stellate" would, perhaps, be a trifle more suggestive of its appearance; but, though usually small, it may reach a considerable diameter. There are five stamens, whose anthers burst inwards, so as to discharge the pollen towards the centre of the flower; and the ovary is surmounted by three stigmas, though internally it may

have one, two, or three chambers. Each chamber contains an ovule; but only one becomes a seed.

The origin of the name is obscure. When, in his first Eclogue, Virgil writes—

"Quantum lenta solent inter viburna cupressi"—

Messrs. Lonsdale and Lee, ingeniously but without much authority, translate "as cypresses are wont to tower among the bending osiers." The sense evidently requires some flexible wood, and *Viburnum* has been connected with the verb *vieo*, I bend; whilst it is also pointed out that, though Linnæus transferred the name *Lentago* to a North American species of *Viburnum* with more pliant branches, the Italian name *Lentaggine* applies to our Wayfaring-tree (*Viburnum Lantana* L.). Parkinson writes:

"Although the signification of *Viburnum* doth properly entend the young twigge or shoote from the roote of a tree, yet it is not improbable that *Virgil* in citing these verses should meane this tree also, called *Viburnum*, (that it might hold his comparison to the Cypresse, of the meanenes of other Cities unto the statelines of *Rome*) as divers learned men think, which are *Gesner*, *Matthiolus*, *Camerarius*, *Durantes* and *Lugdunensis*, &c., and because that the Italians in their vulgar tongue, call it *Lantana* (*quod lenti sunt rami*). . . . Ruellius saith he found it without Paris, which the Country people called *Blanche putain*, and both he and *Lobel* doe call it *Viorna Gallorum*, as peradventure derived from *Viburnum*, and yet they call another ramping bush *Viorna* also, which I have shewed you before among the clamberers, to be the *Atragene* of *Theophrastus*, unlesse the French have two *Viorna's*, which is doubtfull. . . . The *Italians*, as I said, call it *Lantana*, and *Viburno*, the *French Viorne*, as *Ruellius* saith, and *Hardeau* also, from the *French* word *Hard*, which signifieth a band or rope."

The other French *Viorna* is the wild *Clematis*, the modern "Viorne des pauvres."

As seen in the hedgerow, the yearly victim of the bill-hook or shears, *Viburnum Lantana* appears rather rigid than pliant; but when young it grows rapidly, and in coppice woods will produce shoots five or six feet long. These are still used in Germany in basket-making and for tying faggots. Parkinson says of it, "the branches hereof are so tough and strong withall, that they serve better for bands to tye bundels or any other thing withall, or to make wreathes to hold together the gates of their fields, then either withy or any other the like." It is similarly to its casual rustic use for whips that the bush owes one series of its English names. "Lithe-wort" and "lithy-tree," and the Hampshire "Whip-Crop" and "Twist-wood," all have this reference, "twist" being a local term for a switch.

Another series of popular names is obviously suggested by the thick covering of star-shaped hairs with which both its branches and leaves are densely covered. Thomas Johnson, in his edition of Gerard's "Herball" (1633), which Ray termed the "emaculate" edition, says, "I enquired of a countryman in Essex if he knew any name of this; he answered, it was called the Cotton-tree, by reason of the softnesse of the leaves"; and Aubrey, apparently mishearing the name, speaks of it as the "Coven-tree," which is, he says, "common about Chalke and Cranbourn Chase; the carters doe make their whippes of it." Writing elsewhere of the same tree he says, "In and about Cranbourn chace growes naturally a tree with a white leafe; it is no bigger than a cherry tree: they call it Whiting or White-

FLOWERS, FRUIT, AND FOLIAGE OF THE WAYFARING-TREE.

wood ;" and again, " Whitty-tree, or Wayfaring-tree, is rare in this country." Whiten-tree and Whiten-beam seem to be widely known names in the southern and midland counties; and in Devonshire, where, as in Hampshire, ploughboys prefer this shrub for their switches, there is a proverb " as tough as a Whitney stick." The name Mealy-tree, the precise equivalent of that applied in Germany to the White Beam, is also probably an early one as applicable to this species, for in Skinner's seventeenth-century etymological dictionary we have it with the admirably explicit explanation, " sic dictum quia ejus folia, instar farinæ, candida, mollia, et tomentosa sunt " (so called because its leaves are white, soft, and downy, like meal).

William Howitt, with reference to the name under which we have preferred to speak of this tree, as being more distinctive, in his " Book of the Seasons," thus apostrophises it :—

" Wayfaring-tree ! What ancient claim
Hast thou to that right pleasant name ?
Was it that some faint pilgrim came
Unhopedly to thee,
In the brown desert's weary way,
'Mid toil and thirst's consuming sway,
And there, as 'neath thy shade he lay,
Blest the wayfaring-tree ?

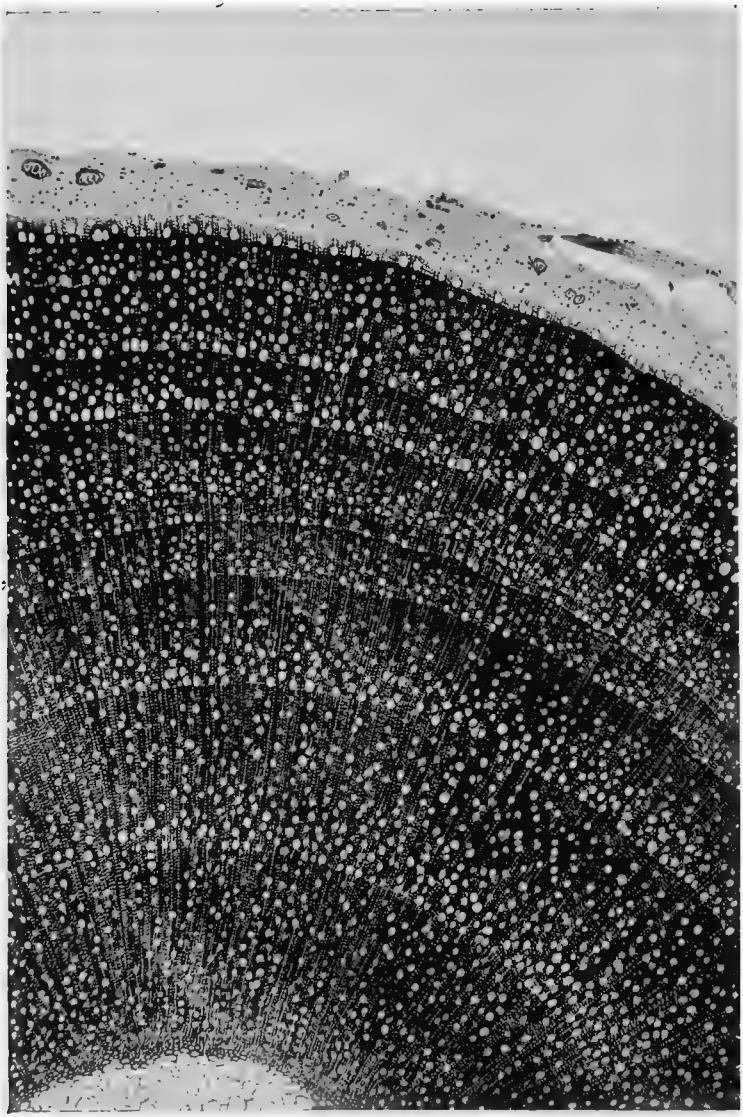
" Or is it that thou lov'st to show
Thy coronets of fragrant snow,
Like life's spontaneous joys that flow
In paths by thousands beat ?
Whate'er it be, I love it well ;
A name, methinks, that surely fell
From poet, in some evening dell,
Wandering with fancies sweet."

It certainly savours somewhat of hyperbole to style the stiff clusters of opaque white blossoms of this tree "coronets of fragrant snow," whilst the "poet" was none other than John Gerard, apothecary and barber-surgeon, so that the "evening dell" may have been in his garden near Fetter Lane, Holborn. Noticing how this roadside bush always looks as if covered with dust, Gerard in his "Herball" (1597) called it "Wayfaring Man's Tree," which, it may be admitted, is, like its author's other coinage "Traveller's Joy," a "right pleasant name," bespeaking something of the poet in its maker.

Under favourable conditions, in the calcareous loam in which it mostly flourishes, the Wayfaring-tree may grow to eighteen or twenty feet high. Its branches spring from the leaf-axils at angles of about 45 degrees with fissured grey-brown bark on their older parts, dotted with lenticels and marked with crescent-shaped leaf-scars; but slightly angular, a paler yellow-brown and thickly covered with mealy grey hairs towards their extremities. The long narrow buds, springing in pairs from each node, in the early part of the year, and the larger and more pointed ones that terminate the leafy shoots, are described as "naked," as in fact they soon become, the two minute bud-scales at their base falling off at an early stage. All the remaining leaves are normal, destined, that is, to expand into ordinary foliage-leaves, and depend upon one another for protection. Each leaf stands erect, folded longitudinally along its midrib, plaited parallel to the strong secondary veins and with its margins inrolled. The short leaf-stalks are slightly dilated at their bases, and

Photo : H. Irving, Horley.

WAYFARING-TREE.



TRANSVERSE SECTION OF WOOD OF WAYFARING-TREE (X 30 DIAMETERS).

leaf-stalks, veins, midribs, and the whole outer surface of the leaves, subsequently to be their under-surfaces, are thickly netted with stellate hairs, mostly ten-rayed, when seen under the microscope, and so intercrossed as to form a sort of grey felt. Those species of *Viburnum* which, like *V. Lantana*, have unlobed leaves, are generally stated to be destitute of stipules: such structures have, however, been detected in the Wayfaring-tree at the base of the innermost leaves of the bud.

When in April, or early May, the opposite pairs of ovate leaves unfold, the hairs, which lie flat on their upper surfaces, give the whole bush the appearance of actually revelling in the dust, which often blows over it in clouds as it grows in the roadside hedge. The leaves reach a length of three to six inches: they are thick, opaque, and of a dull, somewhat yellow shade of green, have a heart-shaped base, a bluntly-pointed apex, and a finely-toothed margin, and present an upper surface ridged along the principal lateral veins and copiously wrinkled between them, the whole system of tracery standing out prominently on the under-surface of the leaf.

A little later the flat-topped cymes of small white flowers make their appearance at the ends of the branches. Smaller, and not of so dead a white as those of the Elder, and lacking the delicate pink tinge of the Laurustinus and the large attractive outer florets of its other congener, the Guelder-rose, the blossoms are remarkably articulated at their base, though this does not seem appreciably to affect their attachment to their rigid pedicels nor, until they are

ripe, that of the fruits. Each flower consists of five minute sepals, a short funnel-shaped five-lobed corolla, about a quarter of an inch across, five small stamens projecting beyond the corolla, and a short triple style. As in the Privet, these small flowers are rendered conspicuous by being grouped together; but the stiff flat corymbs have none of the freedom of form of the panicled clusters of that shrub.

It is undoubtedly when the leaves turn colour and the insignificant florets have given place to the berries, that the Wayfaring-tree most claims our attention. The lustrously-polished berries are about a third of an inch in diameter, and at an early stage are slightly compressed laterally. From a pale green they blush to crimson or the opaque red of coral, mottled, where shaded from the ripening rays of the sun, with a creamy pallor, and finally maturing to a purplish-black, all these tints being often seen in a single cluster. This fruit is thought by some to be not unpleasant to the taste, though slightly astringent, and it is greedily eaten by birds. It is said to have been used in Switzerland in making ink, and the old writers describe an elaborate method for making birdlime from the bark of the root. On a dry, chalky soil, however, where some shrubs may refuse to grow, the Wayfaring-tree, in virtue of its autumn leaves and berries, may, perhaps, claim a place in the shrubbery with Yew, Cornel, Spindle-tree, or Elder.

ROWAN.

THE ROWAN, OR MOUNTAIN ASH.

Py'rus Aucupa'ria Ehrh.

LIKE the Pear, the Apple, the Service-tree, and the White Beam, the Rowan, now, perhaps, more commonly known as the Mountain Ash, is a member of the genus *Pyrus*. This genus of the Rose tribe is characterised by its apple-like fruits, or "pomes," with a cartilaginous "core" or "endocarp"—the Hawthorns and Medlars, which form allied genera, having more stony centres to their fruits. The Rowan, the White Beam, and the Service-trees form together a sub-genus, known as *Sorbus*, distinguished by having their small white flowers in branched clusters, technically known as "cymes," which are followed by groups of small berry-like fruits containing but few seeds. The small trees constituting this sub-genus are rather closely allied, differing mainly in the form of their leaves and in the shape and colour of their fruit. The Rowan is sometimes known as the Fowlers' Service-tree, the first word, together with its specific Latin name *Aucuparia*, referring to the use of its berries as a lure by bird-catchers, Latin *auceps*, a fowler.

The name "Service" has nothing to do with this use for the fruit, nor with the ordinary sense of that word, but is probably merely a corruption of the Latin *Sorbus*, though it has been supposed to be derived from the Latin *cerevisia*, beer, the berries of

all the group having once been largely used in brewing. John Evelyn, in his "Sylva," speaks of the fruit of the Rowan as affording "an incomparable drink, familiar in Wales"; and, whilst there the berries are most commonly only made into an infusion, in Russia a spirit is distilled from them, and in the North of Europe they have, in times of scarcity, been even dried and ground into flour.

The name of Rowan has been somewhat improbably derived from the roan colour of the bark; but though this appellation is probably of a far different origin, there can be little doubt that it is to this grey and smooth rind, its graceful ascending branches and "pinnate" leaves, that it owes the name of Ash. Even its clusters of white blossoms resemble at a distance those of the Flowering or Manna Ash (*Fraxinus Ornus*) of the Continent, though the true Ash trees have no relationship to this rosaceous plant.

Whilst the White Beam and Wild Service are also common in rocky, hilly, or even mountainous situations, it is especially the Rowan that rejoices in bleak, rocky crags, overhanging the gills and becks of our mountains. It grows at an altitude of 2,600 feet in the Scottish Highlands, and thus well deserves the prefix "Mountain" to its name. Springing from some bare ledge of yellow sandstone or grey limestone, but conspicuous even in the thickest leafage by its characteristically tinted fruits, in such situations it might well require a poet to describe—

> "How clung the Rowan to the rock,
> And through the foliage showed his head,
> With narrow leaves and berries red."

It was in such situations that it struck the artistic fancy of William Gilpin, who, in his "Forest Scenery," after mentioning that in the Scottish Highlands it often becomes a considerable tree, speaks of it as follows:—

"There, on some rocky mountains, covered with dark pines and waving birch, which cast a solemn gloom over the lake below, a few mountain ashes joining in a clump, and mixing with them, have a fine effect. In summer the light green tint of their foliage, and in autumn the glowing berries which hang clustering upon them, contrast beautifully with the deeper green of the pines; and if they are happily blended, and not in too large a proportion, they add some of the most picturesque furniture with which the sides of those rugged mountains are invested."

This species having a wan-hued bark and lurid fruit, and growing in wild woodland and moor, much legendary lore has collected round it, and it seems to have been used by witches in divination, its name "Rowan" being said to be connected with the Gothic word "run," a whisper, a mystery, divination, or a magic letter, from "runer," to know. Homœopathy is a great deal older than the time of Hahnemann, so that the Mountain Ash became of high repute as a protection against witchcraft, as witness the proverb—

"Rowan tree and red thread
Put the witches to their speed,"

a belief also alluded to in the old poem of "The Laidley Worm of Spindleston Heughs," in the lines—

"Their spells wsre vain, the boys return'd
To the queen in sorrowful mood,
Crying that witches have no power
Where there is roan-tree wood."

It was, therefore, planted near cowhouses and stables; perhaps because the weird sisters were more given to attack the cattle than their owners, or, perhaps—as in the case of the House-leek planted on similar buildings as a protection from lightning—because the frugal farmer thought more of the safety of his stock than of that of his family. Cattle were passed when young through hoops made of its wood, and though this wood was undoubtedly much in request for bows, for which it was second only to the Yew, and though one tradition assigns to the Rowan the honour of being the material of the Cross of Calvary, it was very probably some such superstition that led to its being planted so frequently round Welsh churchyards. So abundant is it in Wales, that at one time it was even known as *Fraxinus cambro-britannica*, the Welsh Ash.

The Mountain Ash attains a height of from ten to thirty feet, and sometimes exceeds two feet in diameter, growing very rapidly at first. It reaches eight or nine feet in the first five, and sometimes as much as twenty feet in the first ten years, after which it spreads out into a loosely branching head, increasing but slowly in height. This mode of growth, rapid at first, and never densely shady, renders it valuable to the forester as a "nurse" for Oak plantations, more especially as its perfect hardiness renders it tolerant of any exposure; and it has also recommended it for our lawns and flower-gardens. It is, moreover, a useful coppice wood for poles, hoops, etc., and its bark is used to some extent in tanning.

The alternately-arranged ascending branches,

FLOWERS, FRUIT, AND FOLIAGE OF THE ROWAN.

springing upward, as has been said, in a lax manner from the trunk, give to the tree an air of negligent grace and lightness, which is enhanced by the colouring and form of bark, leaf, blossom, and fruit. The buds are large, violet-black or grey, covered with a velvety pubescence of long white silky hairs. The leaves are "pinnate," being, as a whole, some six or eight inches in length, but made up of from thirteen to seventeen leaflets, *i.e.* one terminal one, and from twelve to sixteen in pairs. Each leaflet is from one inch to two inches in length, and about one-third as broad, with a coarsely-toothed margin and an acute point. They are at first downy on their under surfaces, and though they lose this character as they mature, they remain, like most leaves, paler on that side, and are fringed with hairs along their chief veins. When the foliage is newly expanded in May, and the gracefully cut, bright green leaflets turn in the breeze, exhibiting their pallid lower surfaces, they certainly form a distinct charm in themselves, apart from the contrasting ashen bark and the creamy clusters of blossom that appear at this period.

The individual flowers are very small, only one-third of an inch across, but they are crowded into a nearly flat or "corymbose cyme," generally nearly six inches across, so that by being massed together they gain the conspicuousness which they do not separately possess. Though the tree has but few insect foes, this massing together of its little honeyed florets procures for it many friendly insect visitants, nearly fifty species having been observed upon its blossoms. These visits are apparently to a great extent necessary

to the setting of the seed, since the stigmas of the flowers become sticky, *i.e.* reach their maturity, before the stamens are ready to shed their pollen; so that no one flower can be fertilised by its own pollen. Other plants with numerous small flowers render them conspicuous in different ways, the Guelder-rose, for instance, by the great enlargement of the corollas of the outer neuter florets; but the Mountain Ash, like the Elder, depends entirely upon the broad expanse of the whole cluster.

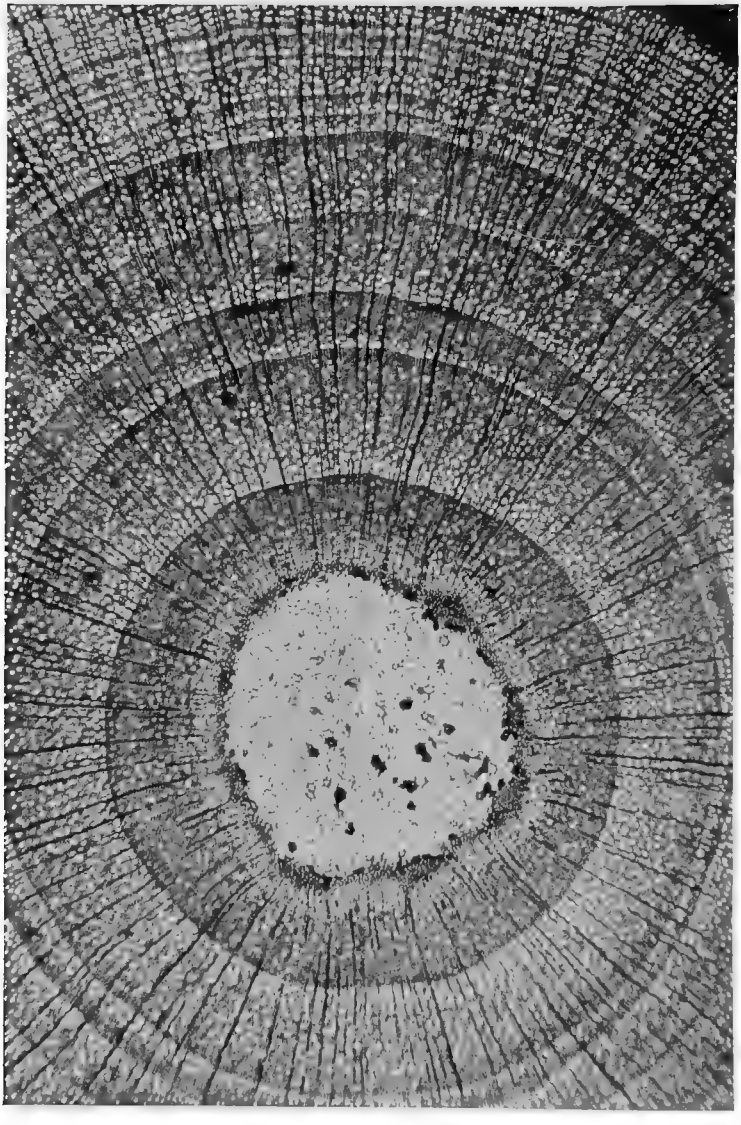
It is, however, undoubtedly after these blossoms have fallen in June or July, when the little Hawthorn-like fruits or miniature apples have, in August and September, turned from unnoticed greenness to a remarkable shade of scarlet, that the graces of the Rowan force themselves upon our notice. Then, as Wordsworth says—

> "The Mountain Ash
> No eye can overlook, when, 'mid a grove
> Of yet unfaded trees, she lifts her head,
> Deck'd with autumnal berries that outshine
> Spring's richest blossoms."

The poet here notices the fact—an important one from the point of view of picturesque effects in form and colour—that the berries of the Mountain Ash turn colour, whilst most of our forest trees still retain their foliage in its summer green. Their hue is not the blood-red of the Guelder-rose, nor the crimson often seen in the haws of the Whitethorn, but a less common tint containing a considerable admixture of yellow, a scarlet sometimes matched in the hips of the Rose. If permitted to do so, the berries will stay

Photo : H. Irving, Horley.

ROWAN.



TRANSVERSE SECTION OF ROWAN WOOD (X 30 DIAMETERS).

on the tree until the leaves have changed colour and fallen; but though the not unwholesome acid fruits are not now much molested by man, they are peculiar favourites with the birds, so much so that Virgil speaks of the tree as attracting thrushes to any grove in which it grew. In Northern Russia, where this tree abounds, the annual ripening of its berries is marked by an immigration of the Bohemian waxwing. The flesh of the fruit is of a bright orange-yellow, as may often be seen in the many wounds the beaks of innumerable finches and thrushes will make in the riddled clusters, while the core is so hard as to connect the species, as has been said, with the Medlar and the Hawthorn.

The undigested seeds of the fruits of this species eaten by birds, or of those of the Service-trees eaten by squirrels or hedgehogs, germinate more speedily than when sown directly in the ground, and may also benefit by being carried to some little distance.

The leaves, in turning, most frequently become yellowish, and decay on the tree to an unornamental brown; but in exceptional situations, or in very favourable autumns—perhaps mostly when the end of September and beginning of October are unusually dry—they, too, become red, and then, as a poetess has said—

> "The scarlet Rowan seems to mock
> The red sea-coral—berries, leaves, and all
> Light swinging from the moist, green, shining rock
> Which beds the foaming torrent's turbid fall."

The writer has here happily suggested an appropriate situation for the tree. It likes a moist but not a

marshy soil, and, if this is well drained, cares little whether it be sandstone or calcareous. Its light and graceful habit should be free from other trees to be well seen: indeed, hardy as it is for any exposure, its outline of branch and leaf will show well against the sky: the grey bark will contrast well either with the lush green growth by the stream, or with the changing tints of moorland bracken and heather; and the gay verdure of the young leaves and the creamy flowers, or the bright autumn fruit, will harmonise equally with the severity of bare stone in the browns or greys of the natural rockery. In such spots, in planting for picturesque effect, should the Mountain Ash be placed, in company with Guelder-rose or Silver Birch.

WHITE BEAM

THE WHITE BEAM.

Py'rus A'ria Ehrh.

As we travel by rail in the month of May through a land of rolling chalk downs, or beneath the regular cliff-like line of some limestone escarpment, a momentary glance may almost deceive us with the impression of a lingering snow-wreath, or at least of a mass of Blackthorn. Delicate greenery may be already waving above the grey boles of the Beeches that crown the summit, and this snowy whiteness appears too high up against the tree-stems in the background to be resting on the ground. A clearer glance shows it to be lifted up in long and broad sprays waving in the breeze above a hedgerow, or in the midst of a copse, in a manner which does not suggest the short rigid branches of the Blackthorn. The wind has turned towards us the characteristic white under-surfaces of the leaves of the White Beam (*Pyrus Aria* Ehrh.). This shrub—for it is rarely that we find it of larger growth—is now in flower; but the loose clusters of its blossoms are hardly whiter than the downy under-sides of its foliage. Thus *P. Aria* comes to bear the old English name White Beam—the white tree *par excellence*, a name including, as also does that of the Hornbeam, our old derivative from the German *baum*, a tree; so that it would be a mere pleonasm to call it the White Beam tree.

A native of the mountains of Greece—where it seems to have borne the name of *Aria* in the time of Theophrastus, the pupil of Aristotle—and most of the countries of Europe, except the extreme north, it occurs commonly in such exposed situations as to deserve well the name *Sorbus alpi'na* applied to it by Bauhin. But though on Kentish downs, on exposed slopes of the Chiltern Hills, or waving from the limestone crags of the gorge of the Wye, or even from the ruined arches of Tintern, it is little more than a bush, and not more than four or five feet high, in more sheltered spots it becomes a tree thirty to forty feet in height, with a single smooth bole reaching three or four feet in girth, and with ascending slender branches giving it a graceful pyramidal outline of head.

The species extends beyond Europe into Northern and Western Asia and North Africa, and has been recorded from more than one spot in Teneriffe, where it is apparently indigenous. In the British Isles the typical form of the species occurs only in the Midland and Southern counties of England and in Ireland, being represented in Scotland and in Cornwall by allied but tolerably distinct forms. On the Yorkshire mountains it ascends to an altitude of 1,500 feet; and in its structure it exhibits several characteristic adaptations for protection against cold.

The old bark is reddish-brown and smooth; but the young shoots are covered with a white mealy down. The twigs later on become smooth, and have a shining surface of a warm reddish or olive brown, marked with conspicuous round lenticels or cork-

warts of a paler hue. Whilst these long, flexible shoots have given the tree in some districts the local names of Whip-crop and Whip-beam, the former of which it shares with the Guelder-roses, affording, as they do, a convenient switch for the passing plough-boy, the tree also bears dwarf-shoots of strikingly contrasted characters. These "spurs" are also pubescent, but are rugged throughout their entire surface with the prominent rings of leaf-scars, the internodes of the stem between them being practically undeveloped, so that the leaves are borne in tufts. Each leaf-scar forms a narrow crescent, showing the severed ends of three principal veins or "leaf-trace bundles." The spurs are given off from the stem at angles approximating to 45 degrees and not uncommonly several of them, each one inch or two inches long, spring in succession from earlier shoots of the same character.

The conical, egg-shaped, olive-green buds are directed upwards, but are not flattened against the stem, the one which terminates the shoot being considerably larger than the lateral ones. The bud-scales are green with brown margins, which are slightly downy and exude a sticky secretion. Lord Avebury, in his "Buds and Stipules," gives us an interesting study in detail of the structure of one of the winter-buds of this tree, which may furnish a useful model for an object-lesson in a country school about the end of April.

The down on the young twigs and on the margins and inner surface of some of the bud-scales, the number of these overlapping protections, the leathery

texture of the outer members of the series, and the viscid secretion with which they are bound together—nay, the very presence of stipules at the base of the young leaves—are all adaptations for the exposed situation of the tree. It has, however, recently been pointed out that these warm blanket-like wrappings do not act in quite so simple a manner as might be supposed: they are not mere blankets to keep out the frost, for the delicate bud tissues may frequently be found in winter with their moisture congealed to ice in spite of all these wrappings, and without any permanent injury to the embryonic shoot. It is probably sudden freezing or thawing which proves so fatally destructive to plant-tissues, expanding the water they contain into ice-crystals, so that the cells are ruptured and torn asunder in the process. Leathery scales, gummy excretions, and thick felts of hair would seem, therefore, to be mainly effective by keeping off damp and moisture from outside and by moderating any changes of temperature within the protected structure, whether in a downward or in an upward direction.

No part of the plant, however, suggests this careful provision against cold so much as the leaves themselves. When young they are "plicate" or plaited in a somewhat fan-like manner; but, as the secondary veins spring from the midrib in a pinnate manner, and not, as in the Maples, radiating palmately from the apex of the leaf-stalk, this folding is not that of an ordinary fan but rather of one constructed with an elongated central axis. In addition to this plication the two sides of the leaf are so folded towards one

FLOWERS, FRUIT, AND FOLIAGE OF THE WHITE BEAM.

another that as they issue from the bud only the under surface is exposed; and, whatever may be the position of the shoot that bears them, they always assume an upright position, standing erect as a series of white pillars. This position of young leaves is explained as exposing a minimum of surface to the cold radiated from the ground beneath them. Both surfaces of the leaves are at first grey with a webbing of fine hairs; but these soon disappear from the upper surfaces, leaving them a shining dark green, while the under surfaces become covered with the dense snow-white down which gives the tree its characteristic appearance as it sways in the breeze. The leaf-stalks are downy and short, not much exceeding one-fifth the length of the blade; and the stipules soon disappear. The blade of the leaf varies considerably in size, form, and margin, the typical plant of South-east England having it broadly oval or elliptic, from three to five inches long, with the margin coarsely and irregularly serrate, except at the wedge-shaped base, and with from nine to fourteen prominent secondary veins from each side of the midrib running nearly straight to the periphery. These secondary veins are sometimes opposite to one another, sometimes not, and are connected by a network of very fine tertiary veinlets.

The White Beam flowers in May or June, its blossoms being in loose flat clusters with downy stalks, each of them about half an inch across, larger individually, that is, than those of the Rowan, though the clusters are not as large. It is somewhat curious that Parkinson should speak of the flowers as

consisting of "four white leaves a-piece," since, like all typical rosaceous blossoms, they have, almost invariably, five petals. The styles vary in number from two to four, but seem to be most commonly three, and they are thickly covered with hairs at the base. By October the fruits are ripe and of a bright scarlet colour dotted over with the little brown points which have given them the name of Chess-apples. They are sub-globose and about half an inch in diameter, their orange-coloured flesh being mealy, and acid and astringent until bletted; whilst the core is leathery and contains two seeds in each of its chambers. Squirrels, hedgehogs, and birds eagerly devour these hedgerow apples, and accordingly in France they are protected by law as a reward for those farmers' friends, the insectivorous birds.

The wood of the White Beam was formerly much used, especially in France, for small turned articles, and more particularly for cogs, which is the origin of its French name "alouchier" or "allouchier," "alluchon" being a French term for a cog. Of the many local names which this tree bears in the British Isles, "Cumberland Hawthorn" would seem to be merely one of Gerard's deliberate coinages; whilst "Sea Ouler," quoted by Parkinson from that part of England, is merely Sea Alder, the tree being specially luxuriant on the exposed seaward front of the Mountain Limestone hills of Lancashire, and its leaf being sufficiently similar in form to that of the Alder.

Though several varieties have been described as in cultivation, such as *obtusifolia*, *acutifolia*, *undulata*,

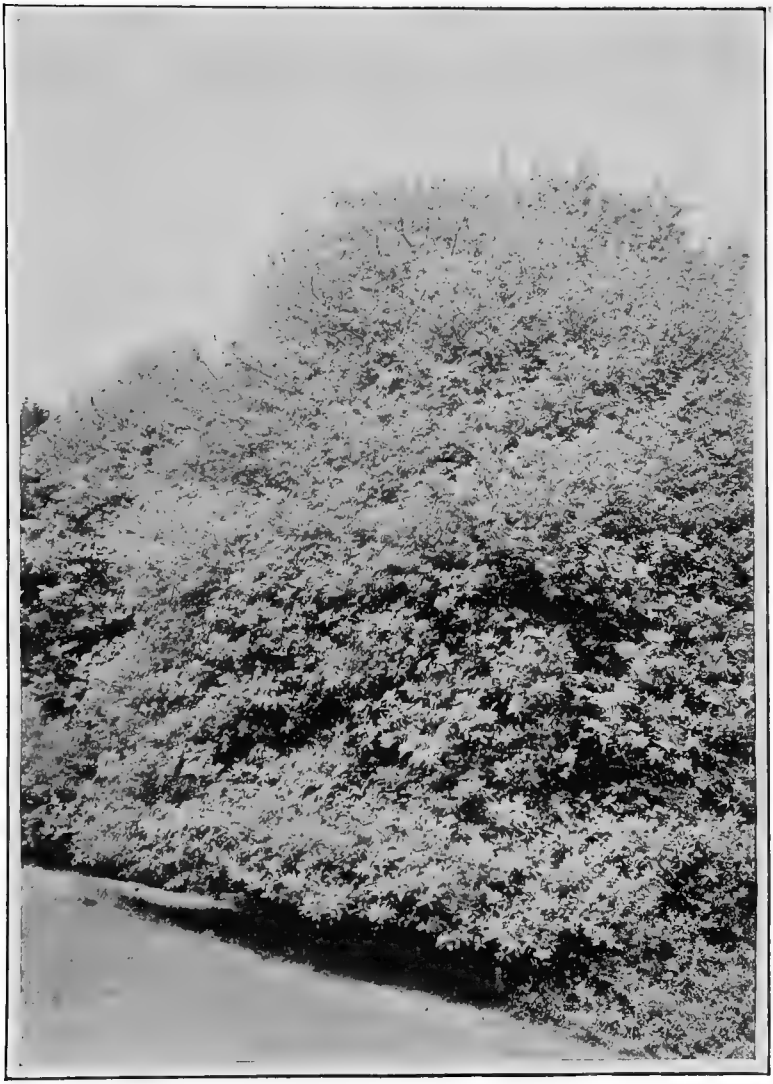
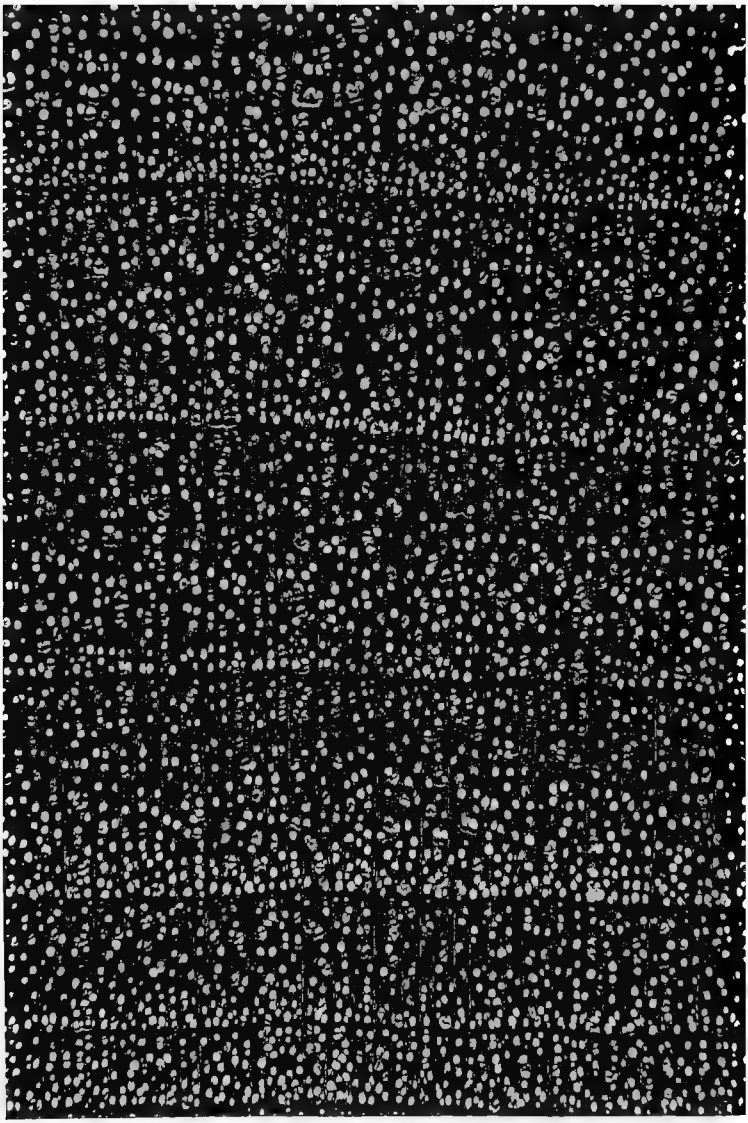


Photo : H. Irving, Horley

WHITE BEAM IN FLOWER.



TRANSVERSE SECTION OF WHITE BEAM WOOD (X 30 DIAMETERS).

angust'ifolia, rotund'ifolia, and *bullà'ta,* which differ from the type merely in the minor characters of the leaves which their names indicate, there are six or seven forms occurring wild in the British Isles, and presenting features so much more marked as to deserve some further description.

Pyrus rupic'ola Syme, described from exceptionally exposed situations, may be merely a depauperate form; but it has a smaller fruit than the type, and its leaves not only differ in form, being obovate, deeply lobed in their upper halves and narrower and entire below, but have their secondary veins reduced to from five to eight pairs.

P. rotundifolia Bechst., the *P. latifo'lia* Syme, seems a very distinct form, recognised on the Continent as the "Elorsier," "Alisier à larges feuilles," or "Alisier de Fontainebleau." It occurs in the Vosges and in Germany, and has been considered a hybrid between *P. Aria* and *P. torminalis;* but it occurs in South-west Devon, where *P. Aria* does not, and its seeds are perfectly fertile. It forms a small tree, from eighteen to thirty or even fifty feet in height, and sometimes over four feet in girth, with broad, ovate-oblong or sub-orbicular lobed leaves having from five to nine pairs of secondary veins and a grey felt on their under-sides. The flowers have a remarkably sickly and disagreeable smell. The two styles are hairy at the base. The globose fruits may exceed half an inch in diameter, and are at first olive-brown with lighter dots; but by October or November become reddish, though never so decidedly so as *P. Aria.* Their flesh becomes an apricot-yellow.

P. interme'dia Ehrh., the *P. scandi'ca* Syme, is the "Alisier du Nord" of the French, the "Schwedischer Mehlbaum" of Germany. It grows at altitudes of 4,500 feet in the Alps and at 6,000 in the Pyrenees, and extends northward to 70° N. lat. A small tree or bush, its leaves are oblong, serrate, pinnatifid near the base and white beneath, and its fruit is scarlet, with a pulpy yellow flesh. It occurs in the West of England, in Wales, and in the island of Arran, where also is found the form, designated *P. fen'nica* by the late Professor Babington, with partly pinnate and grey-webbed leaves and sweet-scented flowers, which is almost certainly a hybrid between the White Beam and the Mountain Ash, as it was thought to be by Linnæus, or perhaps we should say rather of *P. intermedia* with *P. Aucupa'ria.*

P. min'ima is an interesting shrub found in 1895 by the Rev. Augustin Ley in the mountains of Breconshire, growing at an altitude of 1,600 feet. Its leaves are pinnatifid, but narrower than those of *P intermedia,* its flowers have the perfume of Hawthorn, and its small globular fruit ripens by the beginning of September to a bright coral red. It appears most closely allied to *P. intermedia.*

PLUM.

THE PLUM.

Pru'nus spino'sa L.

THE Order *Rosa'ceæ*, though far smaller and less useful to man than the *Legumino'sæ*, includes all our native fruit trees except the Hazel, and, next to the Order *Cupulif'eræ*, to which the Hazel belongs, the greatest number of our British trees. Its arborescent members fall into two Sub-orders, the *Drupa'ceæ*, or "stone fruits," and the *Poma'ceæ*, a group including Pears, Apples, Rowan, Hawthorn, and others, the fruit of which is known technically as a "pome." The *Drupaceæ*, including the Peaches, Nectarines, Almonds, Cherries, and Cherry-laurels, in addition to the Plums, are plants which are obviously related by the character of their fruits, and less obviously by other structural peculiarities. They are all woody plants, though varying through a wide range of sizes. They have simple leaves, arranged singly on the nodes of their stems, generally more or less toothed along their edges—the teeth often terminating in glands—and having sugar-excreting glands upon their leaf-stalks. The flowers are variously grouped, but are restricted in range of colour, being invariably white, pink, or red. They agree, however, in having typically five parts to both calyx and corolla, and, unlike the Apples, Pears, etc., in shedding both these floral whorls when they have "set seed." The stamens are numerous in each flower, and rise separately from the margin of a cup

or "receptacular tube," which encloses the ovary without adhering to it, in what is known technically as a "perigynous" manner. The ovary itself consists of a single carpel, terminated above in a well-developed style and stigma and enclosing two ovules, one of which only as a rule reaches maturity as a seed. The "drupe," or "stone-fruit," which gives its name to the Sub-order, consists of three fairly distinct layers, the outer skin or "epicarp," the middle pulp or "mesocarp" (which is commonly edible) and the inner "stone" or "endocarp," enclosing the brown-skinned kernel or seed. Lastly, many of the trees of the group freely exude a very insoluble gum, especially where their bark is injured; and the foliage and kernels of the entire Sub-order contain hydrocyanic, commonly known as prussic, acid.

The Peaches, Nectarines, Almonds, and Apricots have woolly skins to the fruit; the Cherry-laurels have their flowers in racemes, their leaves "conduplicate" (or folded together down the middle) in the bud, and their fruits smooth and polished; the Cherries have their buds and fruits similar to the Cherry-laurels, but their flowers generally otherwise arranged; whilst the Plums proper, the genus *Prunus* in the more restricted sense, have their leaves "convolute," or rolled up like a scroll in the bud, and their fruits covered with a glaucous "bloom" of wax.

Botanists distinguish three varieties of the Common Plum (*Prunus spinosa* L.), though perhaps most country-folk would assert the distinctness, even in a wild state, of more than that number. When the bark is black, the branches spreading in all directions,

and every twiglet ending in a thorn; when the leaves are finely toothed and smooth beneath; when the flowers come out before the leaves, and have smooth flower-stalks; and when the erect globular purple fruit does not exceed half an inch in diameter, they term it *P. spinosa*, the Blackthorn, or Sloe. When the bark is brown, the branches straight, downy, and with few thorns, the leaves broader, especially near their apex, with larger and blunter serrations, and downy below; when the flowers and leaves expand at the same time, and the flower-stalks are downy; and when the globular fruit is either yellow or purple, and is nearly an inch in diameter, they call it *P. insiti'tia* Huds., the Damson or Bullace. When, lastly, the bark is brown, the branches straight, smooth, and thornless, the flower-stalks smooth, and the under surfaces of the leaves only downy along the veins; and when the purple fruit is oblong and over an inch in length, the tree is an escape from cultivation, although termed the Wild Plum (*P. domes'tica* L.). The Bullace is a larger shrub than the Blackthorn, and the Plum is a small tree, having generally a distinct main stem five to ten feet high.

Though their distinctive characters are not very constant, these forms or "sub-species" differ to some extent in their geographical distribution. The Sloe or Blackthorn (*P. spinosa*) is confined to Europe; whilst the Bullace (*P. insititia*) extends from the Himalayas and the shores of the Caspian, through Armenia, to the north of Africa and to the south of Scotland. The Plum (*P. domestica*) is either nowhere truly wild, or may be so in Anatolia and the

Caucasus, being only naturalised in Europe, and probably of Roman introduction so far as the West, including our own islands, is concerned. In the prehistoric remains from the pile-dwellings in the Swiss lakes, stones of the Sloe and Bullace occur, but not those of the true Plum.

The close relationship of these forms was early recognised. Thus William Turner, in his "Names of Herbes" (1548), writes:—

"Prunus is called in greeke Coccimelea, in englishe a plum tree, in duche ein pslaumen baume, in frenche Vun prunier. Prunus sylvestris is called in english a slo tree, or a sle tree."

Though, strange to say, Shakspere never mentions our native forms under their familiar names of Sloe, Blackthorn, or Bullace, he frequently alludes to cultivated Plums, to Prunes, and once (Second Part of *Henry VI.*, act ii., scene 1) to Damsons; and there can be little doubt that English gardens in his time contained a considerable number of varieties of the fruit. Gerard, in his "Herball" (1597), says:—

"To write of Plums particularly would require a peculiar volume. . . . Every clymate hath his owne fruite, far different from that of other countries; my selfe have threescore sorts in my garden, and all strange and rare; there be in other places many more common, and yet yearly commeth to our hands others not before knowne."

We cannot but admire the beauty of our common Blackthorn; and yet how often in the early spring do we not long to see the last of its beautiful snowdrifts of blossom and of the bitter winds of that "Blackthorn winter" which almost invariably accompanies their presence

FLOWERS, FRUIT, AND FOLIAGE OF THE PLUM.

Desolate indeed is the wintry look of its tangle of black, thorny boughs and twigs, forming some roadside hedgerow, or in clumps on some bleak hill-side; and desolate does it remain till April, about the middle of which month the blossoms generally appear. From a distance one may then mistrust one's eyesight and wonder if it is indeed a line of lingering snow-drift, brought by the north-east gale of last night, that lies on the slopes of the downs; but on a nearer approach the black boughs can be just discerned, each ending in a rigid spine and clothed in a foamy mass of starry milk-white petals.

When, a few weeks later, its flowers are gone and its leaves appear, the tangled Blackthorn with its strong spines forms a thorough protection to the nests of our feathered friends; and, though perhaps from the resistance which its hard wood offers to the shears, and from its tendency to become straggly, it is not so well adapted for garden hedges as the Hornbeam or Hawthorn, it is both useful and picturesque on the margins of our fields and in our roadside fences. In some parts of France it is known as "Mère du bois," its numerous suckers spreading rapidly beyond the margins of woodland, while its dense thorniness protects the seedlings of other trees which spring up through it. In autumn—

> "the ripening Sloes, yet blue,
> Take the bright varnish of the morning dew,"

in silent protest against the partial observation that can only allude to Sloes as black. The Sloe has at first the purple-blue bloom of the common garden Plum; but as the fruit ripens, though in the Sloe it

does not become sweet as in the Bullace and Plum, it loses the bloom of its youth and beauty, and the smooth round balls, pleasing to birds and schoolboys, though contorting the faces of most of their unwary devourers by their astringency, become of a dull blackish-purple. Still they are not black. Soaked in gin, they form a valuable liqueur.

At the present day the green-fruited variety of the Bullace (*P. insititia*) is commonly called a Damson; but there can be little doubt that originally this name belonged to some cultivated variety, the fruit of which was worth eating, and which came from the east, nominally from Damascus.

As has been already suggested, the Plum properly so-called may in all probability be the artificial product of cultivation, rather than a variety existing anywhere in a truly wild state, and was probably introduced by the Romans, by whom it was undoubtedly cultivated on a large scale. Its name in most modern languages is, therefore, as might be expected, derived from the Latin *Prunus*. Just as the name "Currant" has been extended from the small dried Grapes of Corinth to the black-, red-, and white-fruited *Ri'bes* of our kitchen-gardens, so the name "Plum" has been extended from the fruits of *Prunus* to those of other Grapes, more properly known as Raisins. This extension has probably originated in the long-practised custom of drying both kinds of fruit in the sun. This manufacture, though carried on to a considerable extent in the South of France, from which fact we know the dried fruit mainly as "French Plums," is also a staple

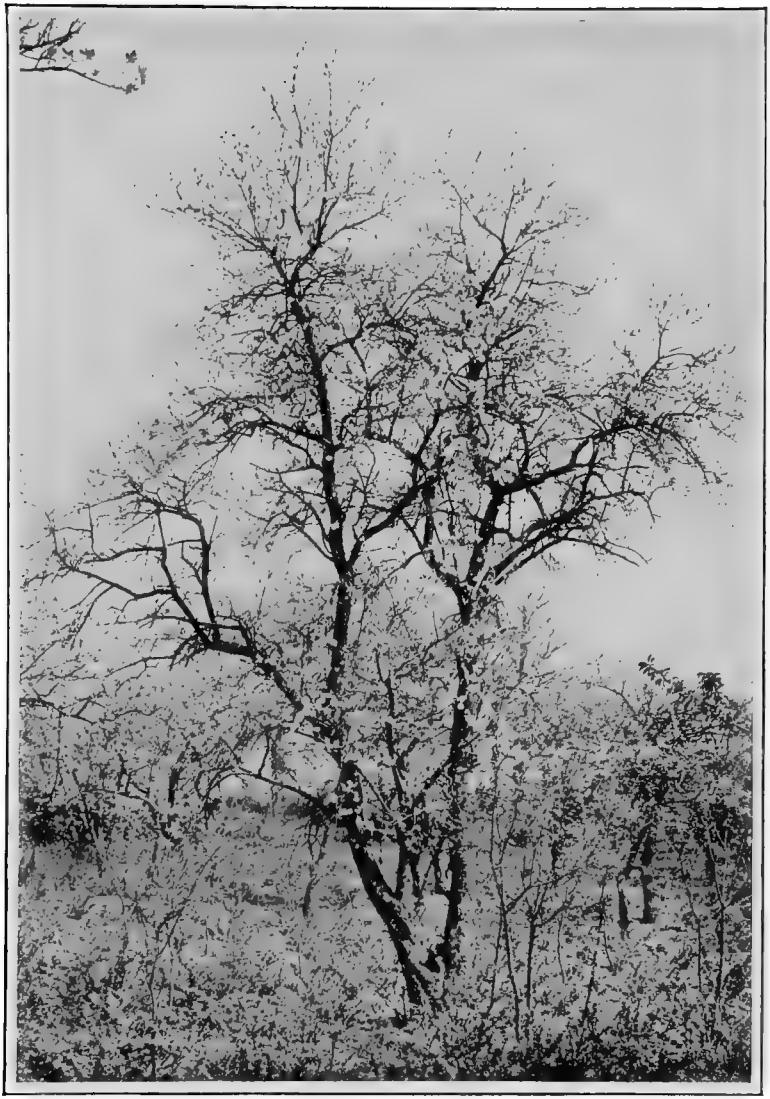
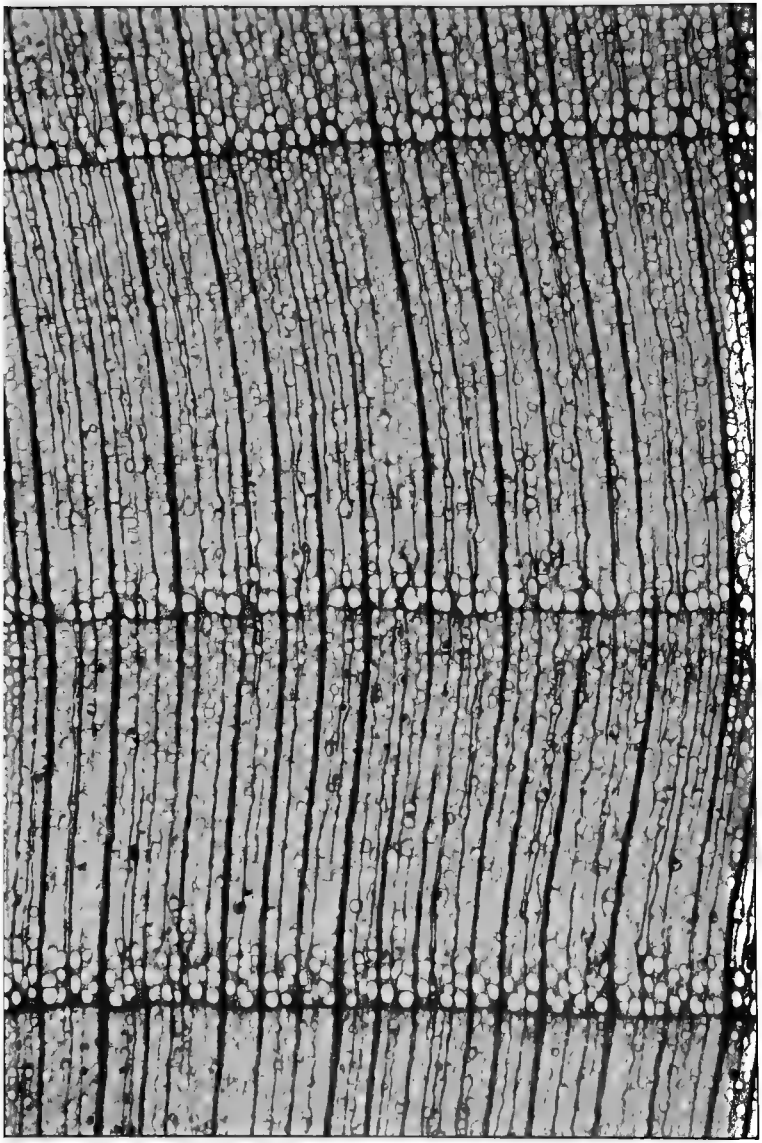


Photo : H. Irving, Horley.

PLUM TREE IN BLOOM.



TRANSVERSE SECTION OF PLUM WOOD (X 30 DIAMETERS).

industry in Spain and Portugal, and more especially in Bosnia and Servia.

The cultivated forms of Plum are extremely numerous, the fruit varying in colour from green, pale yellow or red, up to the deepest purple-black or purple-blue, in shape from globular to an elongated oval or egg-shape, pointed or bluntly rounded at either end or at both ends, and in size from less than an inch to between three and four inches in diameter. We can readily believe that some of our larger fruit-eating birds may not unfrequently swallow the stone of the fruit of the Sloe, which they take whole into their mouths, and thus aid in the dissemination of the species; but it would be difficult to imagine this to occur in the case of the Plum. The cultivated forms vary also considerably in the size and shape of the stones and of the kernels they contain; in the flavour of the fruit, its season of ripening, and other points; and so long-established and physiologically engrained have some of these variations become, that they constitute races which will perpetuate their characters by seed. The Green-gages, the true Damsons, and the Egg-plums, for instance, form races that are often true to seed; but as a matter of practice, layering or, more often, grafting is most commonly used as the method of multiplication.

It is, of course, mainly as a fruit-tree that the Plum is valued; but if it were not so it might well be esteemed for its timber. The very tough and hard wood of the Blackthorn is never of sufficient girth to rank as timber, but it is proverbial, especially in Ireland, as the material for cudgels, and from its

suitable size, strength, and abundance, no wood is better adapted for a farmer's walking-stick. The wood of the Plum is of a beautiful brownish-red, resembling Mahogany; and, being hard and susceptible of a polish, it has been to some extent employed in veneering, and is certainly one of the prettiest timbers that we have.

Though associated with disagreeable weather, the Blackthorn when in bloom is a beautiful and characteristic feature of English landscape that we should be loth to lose; and though the Plum, with its snowy blossoms, creates an impression of chilliness in spring, the whiteness is in its case relieved by the admixture of delicate young foliage, suggestive in its verdure of the sunny days that are coming to ripen the pale flowers into warm-tinted fruit.

TRAVELLER'S JOY.

THE TRAVELLER'S JOY.

Clem'atis Vital'ba L.

THE Buttercup Family, or Natural Order *Ranuncula'ceæ*, with which the enumeration of Flowering Plants generally commences, consists almost entirely of herbaceous plants. Their leaves spring singly from the nodes or joints of their stems, that is, are what is termed "scattered"; and, though often deeply segmented, as in the Buttercups or Larkspurs, are "simple," being all in one piece, with no articulations of distinct leaflets in addition to the one joint at the base or attachment of the leaf. In the brightly-coloured flowers of the Order, the corolla, or inner whorl of perianth-leaves, is frequently absent, as, for instance, in the Marsh Marigold and Anemones, its place being taken by a coloured calyx, or outer whorl, the leaves of which overlap one another in the bud.

It may, therefore, at first seem difficult to understand the reasons which have made botanists class in this Order the genus *Clematis*, of which the Traveller's Joy (*C. Vitalba* L.) is the only wild representative in Britain. Though a straggling, clambering plant, not standing erect on its main stem but twisting over hedgerows or bushes, or the sides of chalk-pits, it has a distinctly woody perennial stem, sometimes reaching many inches in diameter. In the Duke of Rutland's garden at Belvoir Castle

there is a specimen twenty feet in height and forming a tangle thirty feet through. The leaves spring in "opposite" pairs from the nodes, and are distinctly "compound," being made up of from three to nine distinct stalked leaflets; and the white "sepals," or leaves of the calyx, do not overlap in the flower-bud but merely meet so as to touch, like the two halves of a swing-door, or are, as it is technically termed, "valvate."

Plants are, however, classified not by single characters but by that *tout ensemble* which suggests their real affinities or relationships by descent from a common ancestor; and there are after all some marked resemblances between *Clematis* and the rest of the *Ranunculaceæ*. The juice is acrid; the long feathery "awns" or persistent styles, to which the shrub owes its popular name of "Old Man's Beard," are closely similar to those of some Anemones; there is the same indefinitely large number of stamens and of carpels in the flower, and the same entire absence of all fusion or union between the parts of the flower, as in the rest of the Order.

At the same time this recognition of the true test of affinity in plants is one of the greatest achievements in the history of the science of botany, and must always be honourably associated with the name of Jussieu. Conrad Gesner, who died in 1565, had, it is true, proposed that plants should be classified according to their flowers and seeds; and his pupil Cæsalpinus, in 1583, carrying out this suggestion, recognised several of our modern "Natural Orders"; as also did our English botanists Morison and Ray in

the seventeenth century. Their French contemporary Tournèfort based his grouping too exclusively upon the corolla; but the German Bachmann, or Rivinus, in 1690, took not only the corolla but also the fruit and seeds into consideration. Linnæus in 1738 expressed the hope that a "natural system" might be arrived at by the consideration of "the simple symmetry of all the parts," and himself made out sixty-seven "Orders." It was upon the basis of this unfinished sketch by Linnæus that Bernard de Jussieu arranged the plants in the garden of the Trianon for Louis XV. in 1758; and it was in the study of this arrangement that his nephew Antoine Laurent de Jussieu discovered the principle of the relative value of characters. This principle he enunciated in 1773 in a paper read before the Académie des Sciences, in which he used this Order Ranunculaceæ as the illustration of his system.

In early spring the apparently lifeless tangle of twisted, grey, ragged stems of our wild English Clematis, to which the wiry leaf-stalks and some of the withered brown leaves and shabby tufts of feathered fruitlets are still clinging, puts forth rapidly elongating and gracefully curving shoots. These young stems are six-angled, of a dark olive-green colour, and slightly downy. The leaves of the new year unfold early in a vivid yellow-green which may well have suggested to Gerard his name for the plant even before the season of blossom. He speaks of it as "decking and adorning waies and hedges, where people travell, and thereupon I have

named it the Traveller's Joie." The uppermost leaves on a shoot may be only pinnately-lobed, or may be made up of but three delicate ovate leaflets with downy under-surfaces; but the fully-developed leaves are bi-pinnate, with from five to nine leaflets, each three or four inches long, on long slender stalks slightly swollen at each point where two opposite secondary petioles are given off. The leaflets sometimes have irregularly-toothed margins; and their network of veins is rather prominent.

One of the most interesting features of the plant is its method of climbing. Some of the leaf-stalks, the lower sides of which are sensitive to contact, curve themselves once or twice round any stem which they touch, whether of their parent plant or of any other; and, having done so, unlike the similar petioles in our garden Nasturtiums, become rigid and persist for several years. Darwin, who suggested that we have here a first stage in the evolution of tendrils, pointed out that the leaves which twine in this way have fewer and smaller leaflets than those which do not, as if they were on the way to lose their leaf-blades altogether.

The branching clusters of greenish-white flowers, sweet-scented but without honey, thus offering only their copious pollen to their insect visitors, form a new beauty in May and June; but the fruits rising above the withered brown leaves of autumn are even more conspicuous. Each of the little distinct one-seeded carpels of which they are made up retains its own style as a long, feathery, white plume, so that the bush has earned such local names as Grey-beards,

FLOWER AND FRUIT OF TRAVELLER'S JOY.

Beggar-brushes, and Snow-in-harvest, as well as the more general Old Man's Beard.

As our photomicrograph from a small stem shows, *Clematis* has a large rounded pith; and, like many other climbing plants, numerous large vessels in the wood, in order, perhaps, that they should not all be so closed in the bending of the stem as it twines as to prevent the ascent of the sap. These large vessels are unconsciously utilised by the village boy, who smokes short lengths of these stems in lieu of cigarettes, from which fact comes the name Smoke-wood. The deep-seated origin of the secondary cork on the stem throws off the bark in long untidy strips, and contributes to the unkempt appearance of the bush from autumn to spring by which it has earned its French name of *Herbe aux gueux*, *i.e.* Beggar-wort. Its stems certainly seem to bind the hedgerows together, as is suggested by such names as "Hag-rope" (hedge-rope), "Bindwith," and "Withywind," whether they are ever intentionally used for such a purpose by the husbandman or not.

As this shrub occurs both in Greece and in Italy in a wild state, the name κληματῖτις (Klematitis), used by Theophrastus, may have originally been applied to it, though, no doubt, referring also to its allied species. Of these there are three in Greece and seven in Italy. As the name is no doubt derived from κλῆμα, a vine-twig, it is applicable to all of them, and may well have been also extended in a pre-scientific age to the wild Vine, and even to the Bryony. M. Dumolin, indeed, in his "Flore Poétique

Ancienne," cogently argues that the word "viburnum," in the line of Virgil's first Eclogue,

"Quantum lenta solent inter viburna cupressi,"

which we have quoted in speaking of the Wayfaring-tree, is more applicable to *C. vior'na*, a South European species, than it is to any Guelder-rose or Privet, as the whole point of the poet's simile is the contrast of the erect, lofty Cypress with the twining character of the other plant. Certainly the abbreviated specific name of our species, from *Vi'tis al'ba*, "White Vine," may well be borrowed from Ovid's

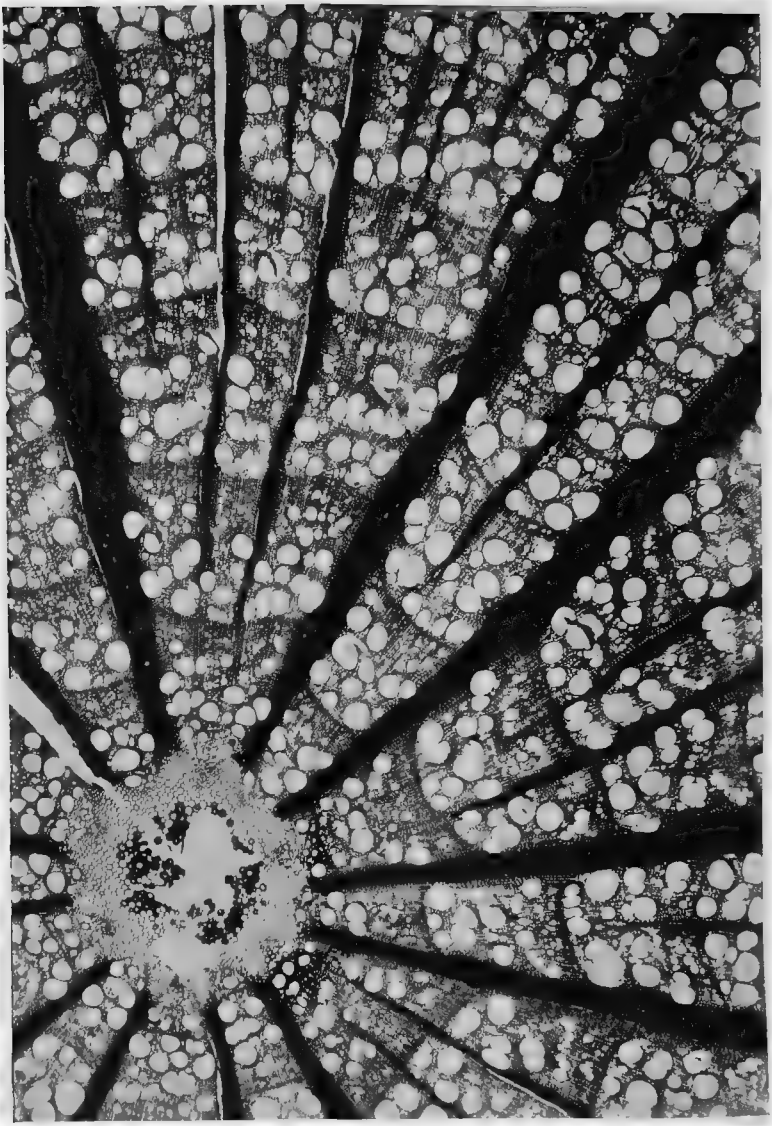
"Lentior et salicis virgis et vitibus albis."

We now know about 170 wild species in the genus; and, though the majority of these are natives of the North Temperate Zone, many of them occurring in North America, many in Japan and Northern China, and several in the Himalayas, yet, as others grow in South Africa and in New Zealand, the group may fairly be termed cosmopolitan. The first of these exotic species to be introduced into cultivation in England was the South European *C. Viticel'la* L., which was cultivated in 1569 by Hugh Morgan, who was apothecary to Queen Elizabeth, and whom Gerard styles "a curious conservator of simples." It may well have been, therefore, by way of compliment to the "Virgin Queen" that Gerard styled Clematis "Virgin's Bower."

Preferring a calcareous soil, our British species is a southern type and is unknown in a wild state in Scotland. Though this English species is destitute of

Photo : H. Irving, Horley.

TRAVELLER'S JOY.



TRANSVERSE SECTION OF WOOD OF TRAVELLER'S JOY (X 30 DIAMETERS).

honey and not very fragrant, some of the other white-flowered species, such as *C. Flam'mula*, the rapidly-growing Continental form, which was cultivated by Gerard in 1596, and the splendid Japanese *C. Fortu'nei*, are extremely sweet-scented. It is somewhat remarkable in this connection that, within the limits of the Buttercup Family, we have well-marked series, both in colour and in specialisation of structure, for insect pollination. From the simple, open, greenish-white flowers of the Meadow-rues (*Thalic'trum*), and of some species of *Clematis*, in which the numerous stamens are sometimes adapted for the conveyance of pollen by wind, and in other cases can only reward their insect visitors with surplus pollen, we pass to the yellow Buttercups and yellow and white Water Crowfoots, with their honey partially concealed and protected by a scale on the base of each petal, to the special honey-tubes of Hellebores, the scarlet flowers of Pheasant's-eye and Pæony; and lastly to the complex and less symmetrical blossoms of Columbines, Larkspurs, and Monkshoods, with highly specialised nectaries and an extensive gamut of colour, including purples and true blues, which are held to mark the highest degree of evolution. In *Clematis*, as also in *Thalictrum*, we have a character as yet unexplained, which is frequent in wind-pollinated flowers, viz., that the stigma reaches maturity—becomes sticky, that is—rather before the pollen of that particular blossom is ready to be discharged. In insect-pollinated flowers the stamens more commonly mature before the stigmas.

Gardeners have added to the many beautiful white, lavender, purple, and red flowers which we have among wild species of Clematis, a vast variety of hybrids, many of which surpass in the size of their blossoms and the purity of their tints all the uncultivated forms. Of these the best known is that universal favourite *C. Jackmanni.* This is believed to have been raised by Mr. George Jackman, of Woking, by crossing the European *C. Viticella* with the Chinese *C. lanugino'sa,* the hybrid first blossoming about 1862. Its large intense violet-purple flowers are produced freely on the shoots of the same year's growth from early summer into late autumn, and are undoubtedly one of the greatest of modern acquisitions to our gardens. Japanese botanists, however, deny the hybrid character of this form, considering it merely a variety of the wild *C. lanuginosa.* Garden hybrids are often grafted on stocks of such common European species as *C. Vitalba, C. Viticella,* or *C. Flammula;* but stock and scion sometimes refuse to unite, or start growth in spring at somewhat different times; so that propagation by layering is more satisfactory.

WELLINGTONIA.

THE WELLINGTONIA.

Sequoi'a gigante a Dec.

THE broad-leaved or fruit-bearing trees ("Angiosperms") belong to many widely separated Natural Orders, and often have herbaceous plants as their nearest allies. There is no evidence of the group as a whole being of any very great geological antiquity. It is, however, very different with the Gymnosperms, those flowering plants without true fruits, bearing their seeds exposed, generally on the inner faces of scales forming a cone, which in systematic grouping are so strongly contrasted with them. Their geological antiquity, their structural isolation from other groups, and the strongly differing types represented among the comparatively few genera, cause these to stand apart, like the monuments of a vanished race. They were the most prominent members of the flora of the whole earth for ages before the appearance of the broad-leaved trees. All the existing representatives of the group are trees or shrubs; and though, in the central pith, the annual rings of wood, and the separable bark, their stems resemble those of broad-leaved trees, in other respects, especially in their floral organs, they approximate rather to the flowerless Cryptogamia. Their seeds contain a store of nutritive tissue or "albumen," and the embryo develops two seed-leaves or "cotyledons," which may

be so deeply lobed as to appear like several. Their flowers are invariably "unisexual"—"dicœcious," for example, or with stamens and seed-bearing flowers on distinct trees, in the Yew, "monœcious," or with stamens and carpels in distinct flowers but on the same tree, in most others; and, with hardly an exception, the flowers are without any perianth. Pollination is effected by the wind, and there is accordingly an abundant production of pollen.

Each male flower consists of an elongated axis, bearing scale-like staminal leaves, arranged either spirally or in whorls: each of these scales may bear two or more pollen-sacs; and the round pollen-grains have sometimes two bladder-like expansions filled with air to aid in their dispersal. Unlike those of Angiosperms, these pollen-grains undergo division into two or more distinct cells; and in one of these, in a few cases, some Japanese botanists have recently detected spirally-coiled "antherozoids" or motile sperm-cells resembling those of ferns and club-mosses. This is the most striking confirmation of the view that the group finds its nearest affinities with the ferns and their allies. The female flower has generally carpellary leaves; these are absent in the Yew, and, when present are never close together to form an ovary and stigma as in Angiosperms.

The group comprises less than five hundred living species, forming some forty-six genera, and these fall into four larger groups or Orders. The Cycads of the southern hemisphere, thick, cylindrical-stemmed plants with a palm-like crown of leathery pinnate leaves, are the lingering remnants of what was one

of the best represented types in the far off epoch when our Oolite limestones were being deposited. The remarkable Maidenhair tree of Japan is the sole living type of another Order; whilst the marvellous *Tumbo'a* of Angola, better known as *Welwit'schia mira'bilis*, is one of the few members of a third. Three-fifths of the existing Gymnosperms, however, belong to the Order *Conif'eræ*.

The *Coniferæ* have a primary root which persists as a well-developed tap-root, giving them the firm hold on the ground which enables them to grow to a great height, and to support a mass of evergreen foliage without being blown over. The most gigantic members of the group, the genus *Sequoia*, have also strong secondary roots, which spread near the surface of the ground; but require a very deep alluvial soil for their most perfect development.

The most obvious character of most Coniferous trees is the straight, tapering stem or "leader," growing generally fast, and of a bulk far exceeding any of its branches, the whole tree assuming the outline of a pyramid or cone, narrow at the base in proportion to its height. But if the trees are crowded together when young, the lower branches, deprived of light and air, die off, leaving traces of their existence as "knots" in the wood of the stem; and the trunk, no longer nourished by branches near its base, increases more in diameter in its upper portion, and thus becomes more cylindrical. This is strikingly illustrated in the difference between the stem of the Wellingtonia, as we commonly see it in this country, clothed with branches to the ground, and that of the

huge trees of the same species in the "groves" of California, which now rise bare of branches more than 100 feet from the ground.

The wood of the Coniferous stem is, as we saw in our Introduction, very distinctive in its structure, mainly by reason of its simplicity as compared with that of the broad-leaved trees. Though generally quick-grown and soft, it is remarkable for strength and durability. The stem increases in diameter "exogenously," but its "cambium," or layer of growing tissue immediately below the bark, gives rise to very uniform secondary wood, consisting of radial rows of "tracheids" or elongated thick-walled cells, divided by pith-rays of only the width of a single cell, and invisible, therefore, to the naked eye. The "tracheids" have on their radial walls numerous translucent thin spots known as "bordered pits," which give a very characteristic appearance to sections of Coniferous wood under the microscope when they have been cut "with the grain," *i.e.* longitudinally. In the stem and in the leaves the *Coniferæ* develop "ducts" or tubular spaces in which the resin that constitutes so marked a feature of the group is secreted.

The leaves of *Coniferæ* are simple and generally evergreen, being either needle-shaped or at least narrow, or flat and scale-like and closely adpressed to the stem. The needle-like leaves have an internal anatomy which is at once distinctive of each species and specially adapted to restrict the amount of transpiration. Their epidermis is made up of elongated fibre-like cells, with very thick outer walls; the few stomata are deeply sunk among these cells; the

SHOOTS AND CONE OF WELLINGTONIA.

inner, or "mesophyll," tissue has the walls of its cells furnished with plate-like infoldings; there are but two parallel vascular bundles forming a single midrib, and round this several resin-ducts are grouped.

The Order is sharply separated into two very unequal sub-divisions, which we may term Families or Sub-Orders, the *Pina'ceæ* and the *Taxa'ceæ*. Of the latter group the Yew is the only familiar example.

The *Pinaceæ* are mainly North Temperate forms, and the formation of a cone, the scales of which overlap and conceal the ovules, is their main distinctive feature. This Family is divided into four tribes, the *Taxodi'neæ*, including the Sequoias, or Redwoods, of California; the *Cupressi'neæ*, including the Cypresses and Junipers; the *Araucari'neæ*, including the Chilian, Norfolk Island, and Kauri Pines, and other mainly southern forms; and the *Abieti'neæ*, including Pines, Spruces, Firs, Cedars, and Larches.

The *Taxodineæ* only comprise ten living species, though these form five very distinct genera. Their leaves and cone-scales are arranged spirally, their pollen has no wings, and the bract-scales on their cones coalesce with the ovule-bearing scales above them into the mature woody seed-bearing scale. The genus *Sequoia*, now confined in a wild state to California and Oregon, is not only represented in a fossil state in rocks of considerable geological antiquity, but occurred at various periods in the British Isles, as in the Gault clay at Folkestone and in the Eocene lignites of Bovey Tracy.

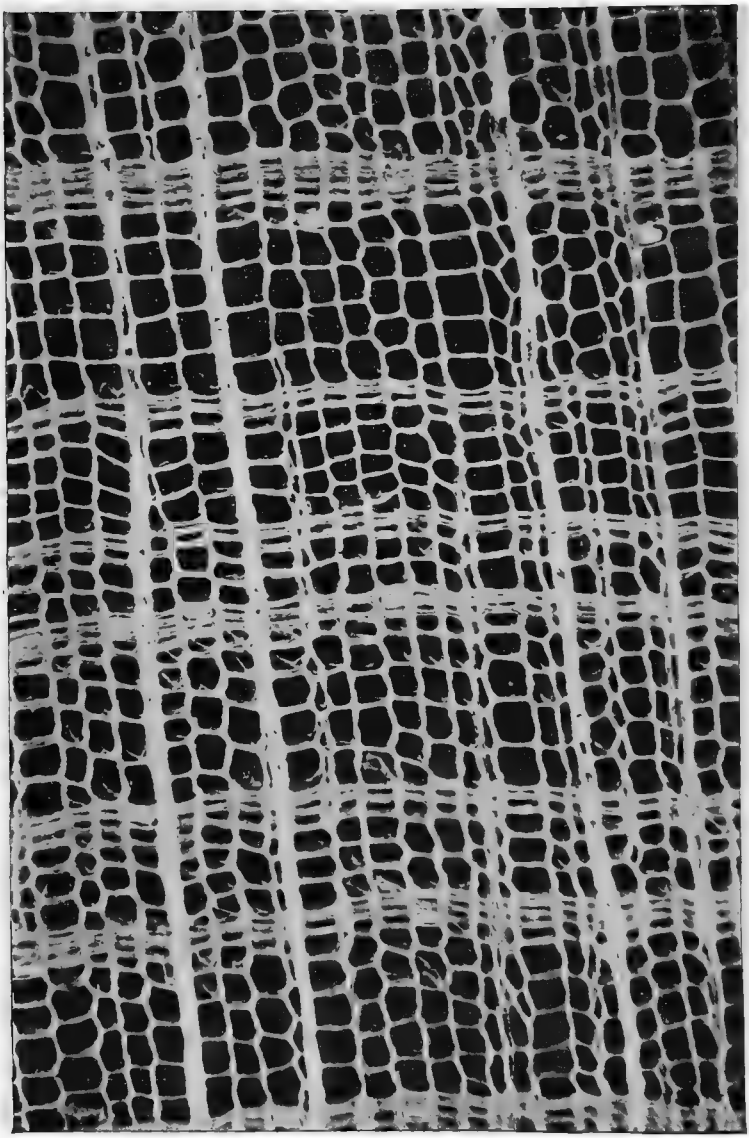
In 1795 Archibald Menzies, who accompanied Vancouver, brought home specimens of the Redwood

(*Sequoia sempervi'rens* Endl.) and of the Douglas Spruce (*Pseudotsu'ga Dougla'sii* Carr.), which were described by Aylmer Bourke Lambert in his magnificent work entitled "The Genus Pinus," the latter in 1803, but the former not till 1824. Lambert, classing the Redwood with the Deciduous Cypress of the Mississippi, named it *Taxo'dium sempervirens*. In 1831 this species was re-discovered by David Douglas, and some fifteen years later it was introduced into English gardens by his successor, Carl Theodore Hartweg. In 1847 the German botanist Endlicher pointed out that the Redwood differs markedly from the Deciduous Cypress, not only in being evergreen, but also in having peltate scales to its cone, each bearing from five to seven pendulous seeds, instead of two erect ones. He accordingly founded for it the genus *Sequoia*, naming it after a very remarkable man. George Guess was the English name of Sequoia, a quarter-bred Cherokee born in Georgia about 1770. Without any knowledge of the sounds belonging to the letters of English or any other language, he invented a phonetic alphabet of eighty-five characters, so simple that it could be learnt in a day. It was published in 1826, and became generally adopted by his tribe. He died at San Fernando, New Mexico, in 1843. In 1853 William Lobb brought two living plants, besides many cones and seeds, of this new species, home to England; and Dr. Lindley, mindful of the fame of the great warrior who had passed away about a year before, wrote :

"The most appropriate name for the most gigantic tree that has been revealed to us by modern discovery is that of the greatest

Photo : E. J. Wallis, Kew.

WELLINGTONIA.



TRANSVERSE SECTION OF WELLINGTONIA WOOD
(X 60 DIAMETERS).

general of modern heroes; let it, then, bear henceforth the name of *Wellingtonia gigantea*."

This appropriation was not pleasing to the Americans, who, too late, suggested that the tree should be called *Washingtonia*. A more complete knowledge of the flowers of this species, however, soon showed its close affinity to the Redwood, so that it had to bear the name *Sequoia gigantea* of Decaisne.

Both trees, when young, have a rapidly-tapering stem covered with a thick, spongy, fibrous, reddish-brown bark, and are surrounded by close-set, slender branches, the lowermost sweeping gracefully to the ground, whilst the upper ones shorten so regularly as to produce a pyramidal outline of which many critics complain. The stems of both species as they get older project below in broad rounded buttress-like ridges several feet across; but so thick a bark as that of the Wellingtonia, in which it reaches two or three feet, is, perhaps, never formed in the Redwood. The main differences between the species are in the foliage and in the size of their cones. The Redwood has Yew-like leaves, spreading in two alternating rows along its twigs. The Wellingtonia, on the other hand, has short, awl-shaped, rigid leaves, closely adpressed to the stem, bluish-green at first, but becoming a dull grass-green. The cones of the Redwood are egg-shaped, not exceeding an inch in length and made up of from fifteen to twenty scales, whilst those of the Wellingtonia are twice as large, and have from twenty-five to thirty scales.

The Wellingtonia, or Mammoth-tree, as we sometimes call it, has never been known to be as abundant

in a wild state as the Redwood. It inhabits the western slopes of the Sierra Nevada, between lat. 36° and 39° N., at altitudes between 4,000 and 8,000 feet; and, though to the south of the King's River it forms an almost continuous forest fifty miles long and nearly five miles wide, it occurs more generally in small isolated "groves." These groves contain the largest specimens, the finest survivors of which are now protected by law. The "Three Sisters" in the Calaveras Grove exceed 300 feet in height, and as some of these tallest examples exceed thirty-five feet in diameter, their bulk is greater than that of the giant Gum-trees of Australia.

In the Natural History Museum, South Kensington, is a complete cross-section of a specimen, sixty-two feet round, which has 1,335 annual rings. The wood is browner than the Redwood, and inferior to it; so that it is only as an ornamental tree that the Wellingtonia is likely to be cultivated in the British Isles. There are many fine avenues and groups of these trees in the three kingdoms, notably at the college founded in honour of Wellington in Berkshire.

SECTION OF NEEDLE LEAF OF WELLINGTONIA, HIGHLY MAGNIFIED.

MAPLE IN AUTUMN.

THE MAPLE.

A'cer campes'tre' L.

THE Maple (*Acer campestre* L.) is the only truly indigenous representative of the genus *Acer* and of the Order *Sapinda'ceæ*. True, its congener the Sycamore is a very common tree, familiar to all, as is also the Horse-chestnut, which is more distantly akin; but neither of these has been more than a few centuries in our islands, whilst the Maple is not only common, but has never been doubted to be a truly wild tree. To distinguish it from its allied species, our Maple is sometimes called the Common, Field, or Small-leaved Maple.

Though it is, perhaps, chiefly with the autumn glories of North American woodlands that we associate the beautifully varied tints of the dying leaves of the Maples, the greater number of the fifty or sixty species of the group are natives of Asia, and chiefly of that part of Asia which lies between Japan and the Himalayas. They are, in fact, essentially trees of the North Temperate zone; but in looking intelligently at our humble hedgerow bush—for the Maple seldom stands alone, or reaches the dimensions of a timber-tree—we should bear in mind, not only the range in space of its existing fellows, but also their interesting extinct representatives in the remote past. It has been suggested that all the floras of the world have had a northern origin, and that plants in general tend to

migrate rather from north to south, and from east to west, than in the reverse directions. In explanation of the first of these lines of passage Darwin pointed out that, as there is more land in the north, the plants of those regions may have existed in greater numbers, and so have attained under competition a higher state of perfection or dominating power; but no one has yet explained the meaning of Bishop Berkeley's dictum that "Westward the course of empire takes its way," at least in so far as it is true in the vegetable world.

Among the most ancient known assemblages of fruit-bearing—*i.e.* "angiospermous"—plants in the world is that in the Lignites, or Brown-coal, of the Dakota group, on the plains of Eastern Kansas and Nebraska, a group apparently intermediate in geological age between our Chalk and the Thanet Sands that overlie it; and here, among many other trees, occur what are perhaps the oldest-known Maples. In rocks far more modern, and yet of immeasurable antiquity—the Miocene beds of Œningen, in Switzerland—as many as nineteen well-marked species of Maple have been discovered, a greater number than occurs in any one district at the present day. The plants with which they are associated have a North American "facies," or general character, and the whole of this Miocene flora is believed to have come from what is now the United States, across Asia, the greater part of it retreating along the same line in a reverse direction, at a later period, before the southerly advance of the increasing cold of the Glacial Epoch. A Tulip-tree in China, the Magnolias of Japan, and a

few other stragglers, still show the line of march; and perhaps our own Maple is a relic of the same time, which has survived the cold, and in our autumn woodlands still surprises us with an exotic wealth of colour.

Some of its congeners are large trees; but the Maple is seldom more than ten to twenty feet high. In sheltered situations, however, it considerably exceeds these dimensions, trees of twenty years of age being recorded as reaching thirty-four feet in height. One at Farnham Castle, in Surrey, is recorded by Loudon, in 1835, as being thirty feet high at fifty years of age; one at Finborough Hall, Suffolk, forty feet at seventy years; one at Braystock, Essex, as fifty feet at eighty years; and one growing in a stony clay at Melbury Park, Dorset, a hundred years of age and only thirty-eight feet in height, having, however, a trunk two feet nine inches in diameter whilst that of its head was thirty-seven feet. The finest recorded Maple, however, is probably that at Blairlogie in Stirlingshire growing in an exposed situation in light loam on dry gravel, which at the age of three hundred and two years had reached a height of fifty-five feet, with a diameter of four feet, and a head forty-three feet across.

The branches of the Maple spread somewhat horizontally; and, when growing apart from other trees, it acquires a compact rounded head, not unlike that of many Sycamores. The bark of the young branches is smooth, but early becomes brown, rough, and corky, splitting in longitudinal furrows, and affording a pleasing contrast to the crimson stalks of the young

leaves and to the somewhat sombre greens of the foliage. The white milky juice, or "latex," in the young parts is also characteristic.

All the Maple group have three principal veins or ribs radiating from the base of the leaf, and in most cases the blade is lobed in a correspondingly palmate manner. The leaves of our English Maple seldom much exceed two inches across, averaging only an inch and a half; but their outline is very characteristic, the five main lobes of the leaf, and the clefts or "sinuses" between them being alike rounded, whilst the base of the leaf is broad and obtusely cordate—*i.e.* heart-shaped. They have generally a few slight notches in the margin; but are sometimes quite entire. The slender leaf-stalks, over an inch in length, are crimson, and the young leaves are downy and of a blue-green tint, which afterwards changes as they become smooth to a shade in which there is a considerable admixture of brown and yellow. In a favourable autumn they turn to the clearest lemon-yellow, not retaining a trace of green, and not decaying to the copper-brown of sodden decay until they have fallen from the tree; so that, though less varied than those of their kinsfolk the Horse-chestnuts, they are brighter and less melancholy in their associations.

It is distinctive of our Common Maple that its inconspicuous clusters of green flowers terminate the young shoots of the same year, instead of being produced by lateral buds altogether distinct from those which develop into foliage, as is the case in many other species of the genus. These clusters stand erect, unlike those of the Sycamore, which hang downwards;

FOLIAGE AND FRUIT OF MAPLE.

and the peduncles, and even the sepals, anthers and ovaries, are downy, so as often to seem to be thickly covered with dust. Inconspicuous as are both sepals and petals among the young leaves in May and June, they offer but little attraction to insects. The flowers low down in the cluster are male or staminate, the terminal ones bi-sexual, and, sometimes at least, "proterandrous"—*i.e.* the stamens first coming to maturity, so that, though they may commonly be fertilised by the wind, or even be fertile with their own pollen, the flies that do visit them undoubtedly effect an occasional cross.

The fruit is a characteristic of the genus, the hairy ovary at an early stage in its development showing signs of the wings that are to grow from the side of either carpel; so that it forms a two-winged "samara," like two blades of a screw paddle, with a chamber at the base of each containing one seed, though there were at first two ovules. Continental botanists have subdivided the species *Acer campestre* of Linnæus mainly according to the presence or absence of down on ripe fruit, our British variety, in which this is present, being termed *A. mol'le*, or *A. campestre hebecarp'um*. The varieties, however, agree in having the wings of the samara smooth, and spreading almost horizontally—in which they differ from those of the Sycamore, which are "ascending," as they do also in size—each wing being only about half an inch in length and of a somewhat oblong outline, and tinged with red. The function of this double-winged fruit is clearly seen when it falls whirling in the autumn breeze, wafting the seed to

some spot where it may have a good chance of growing up without exclusion from light and air by the boughs on which it formerly hung.

The wood of the Maple is excellent as fuel, and can be made into charcoal of the best quality; but being compact, fine-grained, and often beautifully veined, besides taking an excellent polish, it is chiefly in demand for ornamental purposes. Tables made of this wood were much prized among the ancient Romans, and veneers and various turned articles are still made from it, especially in France. The wood of the roots is frequently full of knots; and mediæval alms-dishes, known as "mazer" bowls, made from it, highly polished and generally silver-mounted, are among the prizes of the virtuoso. Allied North-American species yield the beautifully-mottled furniture-woods with which we are all familiar, and which are so commonly imitated by the grainer.

In France the young shoots, being tough and flexible, are employed as whips; and being exceptionally tolerant of the shears and the bill-hook, the tree recommends itself for hedges and the "topiary" work of geometrical gardening. The leaves and young shoots are also gathered when green, and dried for winter provender for cattle; but though the sap contains a larger proportion of the sugar so characteristic of the genus than does that of the Sycamore, the tree does not bleed freely. Maple sugar is obtained from American species, especially *A. barba'tum*, the Rock or Bird's-eye Maple, and *A. ru'brum*, the Scarlet or Curled Maple, the latter only yielding half as much as the former.

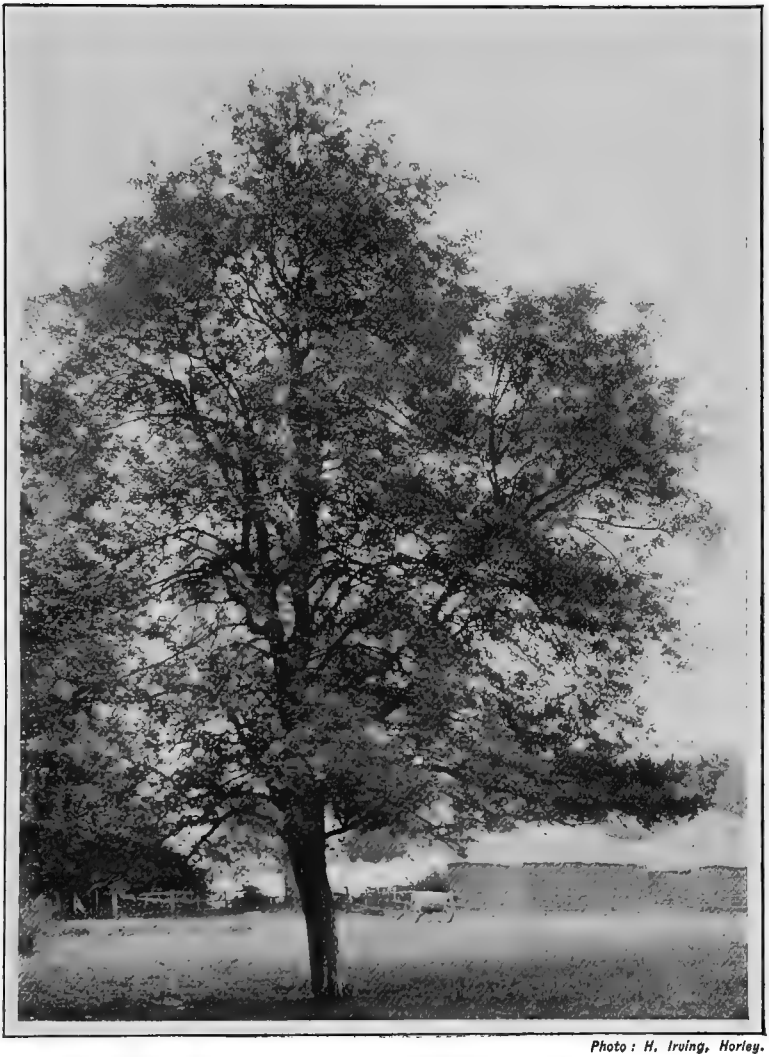
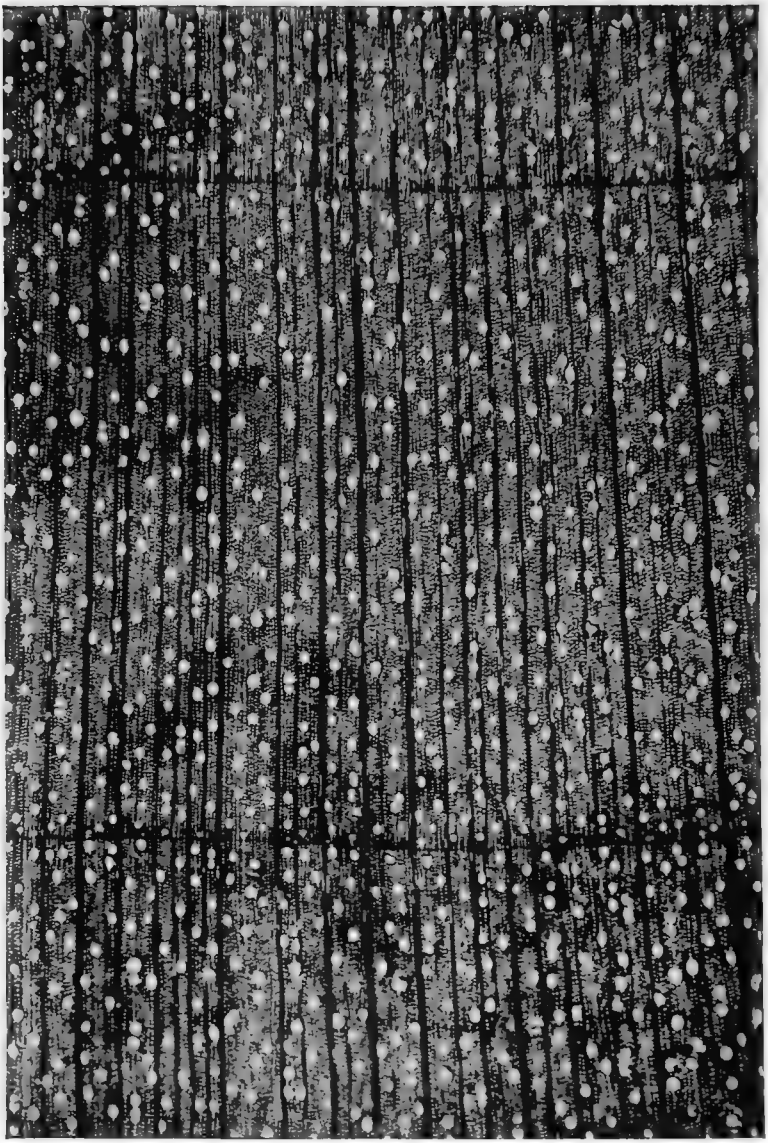


Photo : H. Irving, Horley.

MAPLE.



TRANSVERSE SECTION OF MAPLE WOOD (X 30 DIAMETERS).

Though, in the words of Tennyson, our own Maple in autumn will "burn itself away" till all the woodside glows in the fitful sunshine like dead gold, so as to commend itself to him who plants for beauty, our native woodland trees can seldom show any autumn colouring that can vie with the surprising blaze of an American forest in the fall, an effect mainly due to the Scarlet Maple, *A. rubrum* L. This, together with most of the American and Japanese species, is now commonly cultivated as an ornamental shrub in England, its red flowers in spring being less conspicuous than its autumn coloration. The Sycamore-like *A. rufiner've'* Sieb. and Zucc., from Niphon, with red veins to the leaves, and the many varieties of *A. palmatum* Thunb., commonly known as *polymor'phum*, from the same country, such as the cut-leaved *dissect'um* and the copper-tinted *atro-purpu'reum*, are desirable trees for park and shrubbery; whilst our suburban gardens are now almost overstocked with the allied variegated Box-Elder, *Negun'do aceroi'des* Moench. The bright green of this species, however, with its milky whiteness delicately tinged when young with pink, is well suited to contrast in such situations with the regular and sombre Wellingtonias, with "purple" Beeches, or with masses of green Lilac bushes.

Maples are chiefly propagated by seed, though the varieties must, of course, be multiplied by layers, cuttings, or grafts. The seeds ripen in October, and when the samaras, or "keys," as they are popularly termed, begin to turn brown, they should be gathered

by hand, and the maturity of the seed be tested by opening one or two of the capsules, and observing if the cotyledons are green and succulent. It is advisable to keep the seeds unsown until spring, since moles eat many of those sown in autumn; but those of our common species seldom germinate until the second or third year. They should not be covered with more than half an inch of soil.

Besides being occasionally blotched in autumn by the attacks of the black fungus *Rhytis'ma aceri'num*, so universal on the Sycamore, the leaves of the Maple are also commonly disfigured either by a mildew or by a gall. The Maple blight or mildew (*Unci'nula bicorn'is*) gives the whole plant a hoary appearance, as if sprinkled with powdered chalk, both surfaces of the leaves being alike affected; but this disease must not be confounded with an unhealthy condition formerly attributed to another fungus, and known as *Eri'neum aceri'num*, which in spring produces patches of pinkish or violet hoariness on the under surfaces of the leaves, glistening like hoar-frost. With equal frequency the leaves of the Maple are seen to be thickly studded on their upper surfaces with red conical swellings. These are the results of the punctures of a mite (*Phytop'tus myria'deum*), and they are interesting as an example of the general rule that when such irritation occurs, as is also seen in the galls on the Rose and the Violet, if a pigment is produced it is one which the plant is prone to develop normally either in flower or leaf.

TAMARISK.

THE TAMARISK.

Tam'arix an'glica Webb.

WITH our moist climate and generally fertile soil, it is only the sandy sea-shore, more or less permeated by saline or brackish water, which in its vegetation shows us any parallel to the desert areas of other climes. Sea-holly, Sea-kale, the yellow Horn-poppy, and other fleshy plants covered with a blue-grey bloom of wax, flourish amid the shingle; Tamarisk bushes may wave their feathery branches along the margin of the beach; and the short turf of the neighbouring down will be diversified with stunted Furze and a variety of low-growing flowering plants. Henry Patmore, a young poet "dead ere his prime," well expressed the spirit of our southern coasts.

> "The tamarisks bowed their heads, compelled
> By no ungentle force;
> The breeze a sunny fragrance held,
> Mingled of sea and gorse;
> And on the turf the daisies shone:
> The heaving turf's desire
> Was plainly to be trodden on."

The Tamarisks are members of the small Order *Tamarisci'neæ*, one of doubtful affinities but of wide geographical range. They are shrubs or small trees with whip-like twiggy branches, minute scale-like leaves and spikes of small blossoms, growing on the sea-shore, or in sandy places, from Japan and China

to Madeira and the Canary Islands, and from Senegambia to Siberia.

The five genera described as belonging to this Order comprise nearly ninety species, inhabiting steppes, deserts, and shores of temperate and sub-tropical latitudes. The minute, scattered leaves have no stipules; the parts of their little blossoms are in fours or fives, except that their stamens are sometimes twice as many, or even indefinite in number, and that their one-chambered ovary may be made up of two, three, four, or five carpels. Their seeds are furnished with a plume of hairs to aid in their dispersal, like those of the Willows.

The genus *Tamarix* includes sixty or more of the ninety species described, and has a geographical range almost as wide as that of the whole Order; but many of the forms to which some botanists have accorded specific rank may be little more than variations produced by changing local conditions.

T. anglica Webb is a very doubtful British plant, and seldom approaches the dimensions of a tree; but its tolerance of sea-breezes, the bright green of its almost perennial foliage, contrasting with its red-hued branches and its delicate little spikes of pink blossom, make it a most valuable acquisition to our coasts.

Its slender branches would suggest a Willow, did not the minute, closely-overlapping leaves immediately recall the Heaths and the Cypresses. It is indeed said to be still occasionally known as "Cypress" in Cornwall, and seems to have been confused with the Heaths by some of the ancient botanical writers.

Both its branches and its leaves are free from hairs; but the latter are slightly glaucous, while the colour of the smooth surface of the former changes with age from red or purple to brown. These numerous branches are often slightly drooping; they bear the scars of many fallen leaves, and are dotted with "lenticels," or cork-warts. The tree commonly reaches ten or fifteen feet in height, but has been known to be thirty feet high in some English gardens.

The spikes of flowers, which open from July to September, are about an inch long and are both terminal and lateral. They are crowded with tiny blossoms that measure but an eighth of an inch across, and arise in the axils of minute bracts. The five sepals are imbricate in the bud; the little petals may be flesh-pink or white; and the five red-anthered stamens spring from a five-pointed disc below the ovary. This disc is probably of considerable importance in the discrimination of the various species of the genus *Tamarix*. Attention was first directed to it in 1827 by Ehrenberg, who subdivided the genus into three sub-genera, *Oligade'nia, Decade'nia*, and *Polyade'nia*, according to the presence of eight, ten, or more lobes in this minute cushion. British and French botanists have perhaps hardly given due weight to a most careful paper on the subject by the eminent Philip Barker-Webb, published in 1841. In this essay it was first pointed out that there are two distinct kinds of Tamarisk on the shores of France. In one of them, which occurs on the shores of the Mediterranean, the five stamens spring from between

the five bi-lobed crenulations of the disc, the capsule tapers gradually, like a pyramid, from base to apex, and the tufts of hair of the seeds do not quite reach to the apex of the capsule. This species, which reaches from ten to thirty feet in height, is that which Pena and Lobel described in their "Adversaria" (1570), as *Tamaris'cus narbonen'sis*, and which Linnæus named *Tamarix gal'lica*. The other species is that which grows along the western and northern coasts of France, from Bordeaux to the Seine, and in England, for which reason Webb distinguished it as *T. anglica*. This seldom exceeds ten feet in height. Its five stamens are united below in the disc, springing directly from the points of its five lobes; the capsule is flask-shaped; and the tufts of hair on the seeds are distinctly shorter than the capsule. In both forms the ovary is one-chambered, but is triangular externally and is surmounted by three recurved stigmas; its ovules are arranged in three rows.

Common on the shores of the Mediterranean, the Tamarisk was undoubtedly known to the early Greek botanists. Pliny says that it is the *Myri'ca* of Dioscorides; but what the origin of the existing name may be is uncertain. It has been derived from the Hebrew *tamarik*, cleansing, from its use either for purifying the blood or for making brooms; but another etymology is from the river Tamaris, now the Tambro, in the Pyrenees, on whose banks it grows. William Turner in his "Names of Herbes" (1548) writes of it:—

"Myrica, otherwyse named tamarix, and of the Herbaries Tamariscus, is named in duche tamariske, in frenche tameris. I dyd never

TAMARISK: 1, FLOWER; 2, FRUITS; 3, SINGLE FRUIT.

see thys tree in Englande, but ofte in high Germany, and in Italy. The Poticaries of Colon before I gave them warning vsed for thys, the bowes of vghe, and the Poticaries of London vse nowe for thys quik tree, the scholemaisters in Englande have of longe tyme called myrica heath or lyng, but so longe have they bene deceyved al together. It maye be called in englishe, tamarik."

In the face of this statement we do not know why Sir J. E. Smith says that it was "commonly planted in English gardens and shrubberies, long before Archbishop Grindall imported . . . it . . . to cure indurations of the spleen." Fuller says that it was about 1560 that Grindal introduced the Tamarisk from Germany; but Loudon thinks the date 1582, given by Camden and Hakluyt, more probable. It was certainly in 1558 that Grindal returned from the Continent, and it was in the following year that he became Bishop of London; whilst it is to this period of his life that the story belongs of Queen Elizabeth's visiting him at Fulham and complaining that he had planted so many trees round his house that she could not see out of her bedroom windows. In 1582 Grindal, then Archbishop of Canterbury, became blind, and in the following year he died, nor did he ever revisit the Continent after 1558. The "German Tamarisk" introduced by him was probably the glaucous shrub now known as *Myrica'ria german'ica*. Gerard, in the catalogue of plants in his garden in 1596, enumerates "*Tamariscus Germanicus aut Nerbonensis*," and "*Tamariscus Italicus*"; and Parkinson, who distinguishes four kinds in his "Theatrum Botanicum" (1640), informs us that "the leaves boyled in wine and drunk . . . helpeth the jaundise, and the chollick, and the bitings of the Spider *Phalangium*, the

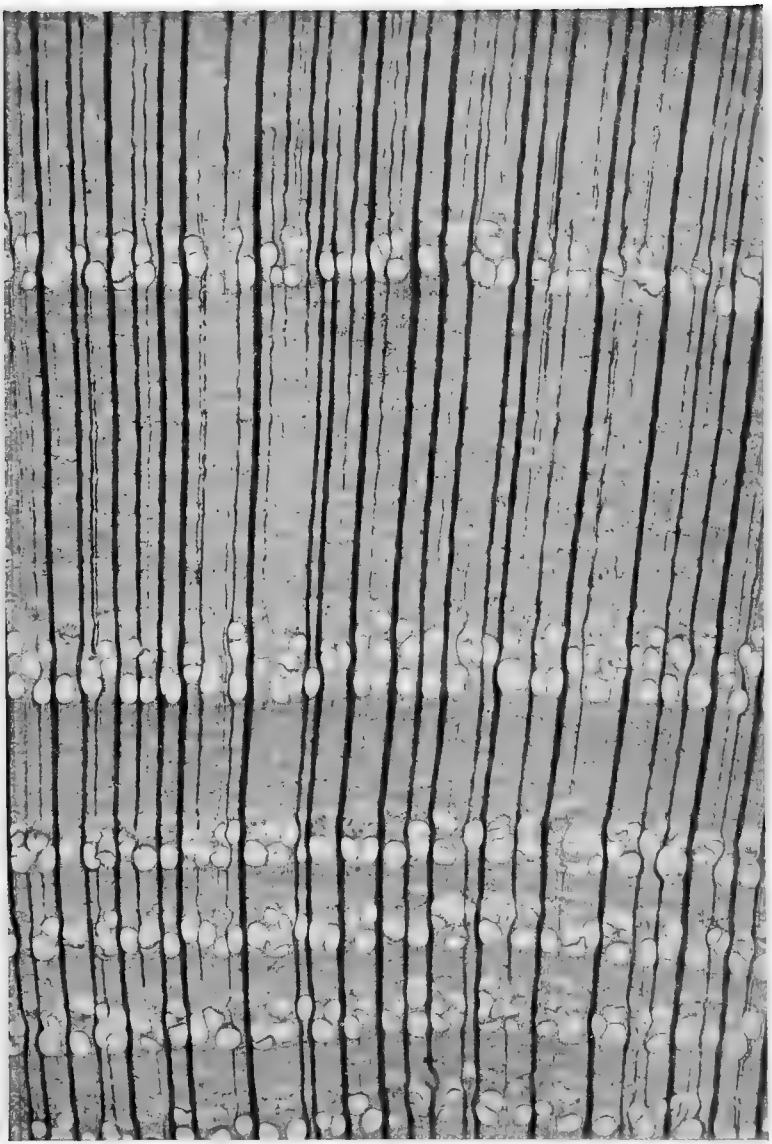
Viper and all other venemous Serpents, except the Aspe."

The ash, both of the stem and leaves, contains an abundance of sodium sulphate; and it is probably to the presence of this salt that the plant owes its diuretic properties, which were recognised by Galen and Dioscorides, and by the early Arabian medical writers. A decoction of the young twigs is said to be used by the Tartars for rheumatism and for bruises, and the plant has been used in Denmark as a substitute for hops. Two species are employed as astringents in Indian medicine; but galls produced on them by insect puncture are more powerful than the plants themselves. A Syrian species, closely allied to *T. gallica*, when punctured by an insect, *Coccus manniparus*, exudes a mucilaginous sugar which the Arabs term "manna." Burckhardt thus describes the secretion of this plant, which grows abundantly in a valley north of Mount Serbal:—

"In the month of June it drops from the branches upon the fallen twigs and leaves, which always cover the ground beneath the tree in its natural state. The manna is collected before sunrise, when it is coagulated; but it dissolves as soon as the sun shines on it. The Arabs clear away the leaves and dirt which adhere to it, boil it, strain it through a coarse piece of cloth, and put it into leathern skins. In this way they preserve it till the following year, and use it as they do honey, to pour over their unleavened bread, or to dip their bread into. I could not learn that they ever made it into cakes or loaves. The manna is found only in years when copious rains have fallen; sometimes it is not produced at all. It never acquires that degree of hardness which will allow of its being pounded, as the Israelites are said to have done with the manna with which they were miraculously supplied; nor does it possess the same nutritive properties. Some travellers suppose this substance to be the produce of an insect which infests the Tamarisk. The quantity

Photo : H. Irving, Horley.

TAMARISK.



SECTION OF TAMARISK WOOD (X 10 DIAMETERS).

collected is very trifling, perhaps not amounting to five or six hundred pounds, even in seasons when the most copious rains fell. It is entirely consumed among the Bedouins, who consider it the greatest dainty which their country affords. The harvest usually begins in June, and lasts six weeks."

That the Tamarisk has but little claim to be indigenous in England is evidenced by the language used by Robert Turner, in his "Botanologia," as late as 1664. "It is," he says, "well known in Gardens, where it onely grows, in England." As a cultivated plant it was not apparently known, as in France, to be pleasing to sheep on account of its salinity, and its medical repute seems to have been lost, for Browne, the poet, writes of it early in the same century as

"For huswives' besomes onely knowne most good."

In its apparently wild state in England it only occurs along the coast from Cornwall to Suffolk. First noticed about St. Michael's Mount, it has been suggested that it may have been brought there by smugglers, either from the Channel Islands, where it is naturalised, or from the French coast. One would like to think of it as a lasting reminder of the ecclesiastical dependence of the Cornish Mount upon the Norman Mont St. Michel, in the neighbourhood of which abbey-fortress we have seen it growing in abundance. Its introduction into the Lizard district is traditionally attributed to a carter who, having lost his whip, gathered one of the long flexible branches at the Mount, and at the conclusion of his journey stuck the rod into the ground—a story which bears witness to the ease with which this tree can be reproduced by cuttings. So, too, there is a tree in

the Rectory garden on the island of Foulness, which is said to be the parent of all those in that part of Essex, and to have been planted by one of the Dutchmen who embanked the island.

The wood of the Tamarisk is greenish-white when young, becoming rose-coloured or reddish. As will be seen in our photomicrograph, the annual rings are well defined by the presence of a zone of large pores in the spring-wood, whilst in the later-formed wood we have tangentially-arranged groups of much smaller pores. The pith-rays are distinctly visible to the naked eye, and of very unequal thickness. The wood warps and cracks in drying, and is neither durable nor of much value as fuel, though used for that purpose in Egypt, Porto Santo, and other places where wood is scarce. The tree is, however, distinctly useful for binding together and covering sand-dunes, growing in situations too saline for most other species, and attaining a height of ten feet or more in four or five years.

SYCAMORE

THE SYCAMORE.

A'cer Pseudo-Pla'tanus L.

With no claim to be considered as truly indigenous in the British Isles, the Sycamore (*Acer Pseudo-Platanus* L.) is of such ancient introduction, and is now found so commonly, not only in parks and near houses, but also in our woodlands throughout the length and breadth of the country, that few trees are better known. In connection with few of our common trees, however, has there been so great a confusion of nomenclature as with this species. Long ago recognised by the characters of its flowers and fruit, not to mention the arrangement and veining of its leaves, as a Maple, and correctly named accordingly the Great Maple, the remarkable denseness of its foliage, and the grateful shade which it in consequence affords, caused it to be confused in Western Europe, at an early period, with the true Sycamore, or Fig Mulberry (*Fi'cus Sykam'orus* L.) of Scripture, a confusion which it is stated is still retained in the language of flowers, according to which mystic code of symbolism this tree signifies "curiosity," because it is identified with that on which Zacchæus climbed that he might see Christ at His triumphal entry into Jerusalem. This confusion is said to have led to a considerable planting of this species by religious persons in the fourteenth and fifteenth centuries.

Similarly in Scotland it is still commonly

known as the Plane, a confusion commemorated by Linnæus in the specific name *Pseudo-Platanus*, and in the French "fausse Platane." The only resemblance, however, between the Sycamore and the Plane, lies in the form of the leaves, which between certain other species of the Maple group and some varieties of the Plane does indeed amount almost to an identity of outline and of venation. The leaves of the Plane, however, are not in opposite pairs; their lobes are commonly more pointed than those of the Sycamore, and their surface is more glossy, and of a brighter, more yellow shade of green; whilst the globular monœcious catkins and bur-like fruit-clusters of the former are altogether unlike the racemes of greenish flowers, followed by bunches of winged fruits, or "keys," in the tree which we are now considering.

The Sycamore is essentially a native of Central Europe, occurring most abundantly in wooded, mountainous situations in Germany, Austria, Italy, and Switzerland, in which last-mentioned country it ascends on dry soils to an altitude of nearly 3,000 feet above sea-level, suffering but little from frost or snow It will grow in any soil not saturated with moisture, but prefers dry and well-drained ground to stiff clay or loam. It will grow in exposed situations even on the sea coast; and, owing to the stiff, angular mode of growth of its branches giving it an exceptionally strong "spray," as it is technically termed, few trees are better adapted to act as a shelter from the winds in such spots. Even when the winds blow strongly in one direction for nine months out of the twelve, the Sycamore will retain its symmetrical outline, its head

not leaning more to one side than another. It propagates itself rapidly by seed, which is, as pointed out by Professor Thomas Martyn, an argument against its being indigenous in this country, since in that case it would have been more universally disseminated than it is. All our early writers, indeed, speak of the Sycamore as a cultivated species, from Turner, in 1551, and Gerard, in 1597, to Parkinson and Ray, several of these authors alluding to its value in avenues and walks on account of its shade.

The seeds and seedlings of the Sycamore are well worth careful study. As the former grow to their full size within the fruit, the embryo, or young plant, in each of them enlarges at the expense of the surrounding food-store ; and, as it does so, its leaves or " cotyledons " become bent into a complex and variable series of folds. On germination these two first leaves unfold as two dark green strap-shaped bodies utterly unlike the later-formed foliage. The second pair of leaves has the colour and texture of the true leaves; but, though they are broader, pointed, and more like a leaf in veining, it is only in the third pair that the typical five-pointed form is reached.

It is a tree of rapid growth, reaching a good height in a short time. Trees ten years old are recorded as attaining twenty-five or twenty-eight feet in height, whilst the species comes to its full growth of from fifty to sixty feet at an age of as many years. The tree requires, however, to be eighty or a hundred years old before its timber arrives at perfection, and the ordinary longevity of the species is stated at from 140 to 200 years, though several cases of greater age are

on record. Sir Thomas Dick Lauder, for instance, in his edition of Gilpin's "Forest Scenery," mentions a remarkable Sycamore, supposed to be not less than 300 years old, at Calder House, which, in 1799, had a girth of trunk of over twenty feet, and a spread of branches of sixty feet. It was the tree to which in former times the iron jugs, a kind of pillory, were fastened; but this instrument of torture had, in 1834, long been grown over by the annual increment of wood, and deeply imbedded in a protuberance on one side of the massive bole. Another specimen in Friburg, in Switzerland, over twenty-six feet in girth is supposed to be 500 years old. A magnificent specimen at Studley, of unknown age, is figured in Loudon's "Arboretum." It is 100 feet high, over eight feet in diameter, and over ninety feet in the spread of its branches.

Though the foliage is undoubtedly dull in colour, and wanting in variety of light and shade, the tree as a whole, has, when well grown, considerable beauty of outline. Its smooth-barked cylindrical stem rises generally but a few feet from the ground before sending out nearly horizontal branches, the lower of which may form large limbs, reaching, as we have seen, to a considerable distance from the trunk. The branches lessen regularly towards the top of the tree, so that standing alone in a park the Sycamore presents a regular, rounded crown. The twigs are dotted conspicuously with lenticels, and bear well-marked ring scars at the base of each season's growth, with V-shaped leaf-scars below the divergent bluntly ovate buds. The bark and leafstalks of the young shoots

LEAVES AND FLOWERS OF THE SYCAMORE.

are often of a clear blood-red tint, which in early spring is well contrasted with the delicate green of the spreading fans of foliage; for, like many leaves in which the veins are arranged "palmately," *i.e.* radiating like the fingers of the hand, "the broad leaves of the Sycamore" are folded in the bud like the *feuille* of a fan, or, as botanists term it, in a "plicate" manner. These leaves are from four to eight inches across, greyish on their under surfaces, and divided into five pointed lobes, with a margin toothed with rounded serratures. The principal veins are prominent on the lower surface of the leaf; and in autumn, either before or after they have fallen, the leaves are very commonly blotched over, as if with large blots of ink, owing to the attacks of a parasitic fungus, known as *Rhytis'ma*, or *Xylo'ma, aceri'num*. This also attacks other Maples, and is decidedly unsightly.

In May or June the Sycamore bears long pendulous racemes of small green flowers, each having generally six or eight sepals, and as many petals and stamens, the two latter whorls inserted on the edge of a ring-shaped, fleshy disc, on which rises the ovary. This latter is hairy, and has two curved stigmas, whilst it further foreshadows the form of the fruit in two humps like those on the shoulders in a fashionable lady's mantle. As in other trees of the Maple group, the flowers are not all "perfect," some being "male," *i.e.* having no pistil. Hence the number of fruits hanging in an autumnal cluster is far smaller than the number of the summer's blossoms. When two or three kinds of flowers—hermaphrodite, and staminate, or pistillate, or all three—occur in one inflorescence

it is called "polygamous," as is the case not only in most Maples, but also in the allied Horse-chestnut. In summer's heat, "the cool shade of a Sycamore" afforded by the close overlapping of the broad leaves is truly grateful, and one regrets to see in them the early symptoms of coming autumn, when the tree appears, as Cowper says,

> "capricious in attire:
> Now green, now tawny, and ere autumn yet
> Has chang'd the woods, in scarlet honours bright."

Then, too, not only the leaves, but also the twin scimitars of the fruit, are tinged with red. A simple two-veined parachute, adapted to fall, a little later on, in screw-like whirlings in the autumn gales, so as to carry the seed away from the fatal shelter of its parent tree, the curved outline of this fruit, known to the botanist as a "double samara," is well worth the attentive study of the artist or the mechanician. Its inner edges follow, in fact, that celebrated "line of beauty" upon which Hogarth so strongly insisted.

The wood of the Sycamore is used by turners for spindles, bread-platters, butter-moulds, mangle-rollers, and especially for moulds; but it is not very durable. It is white and fine-grained, but soft, and yields a good charcoal for the finer sorts of gunpowder. In former times, however, the tree seems to have been connected in warfare with a very different purpose, for we read that "they were used by the most powerful barons in the West of Scotland for hanging their enemies and refractory vassals on, and for this reason were called 'dool,' or grief, trees. Of these trees there are three yet standing, the most memorable being one

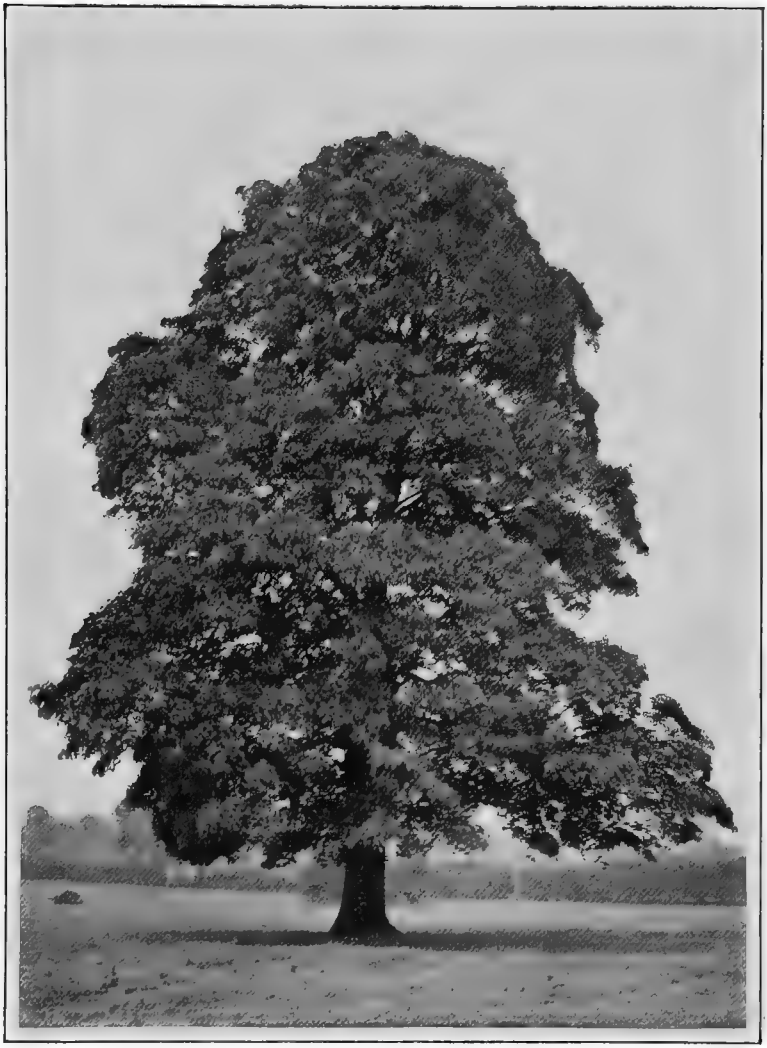
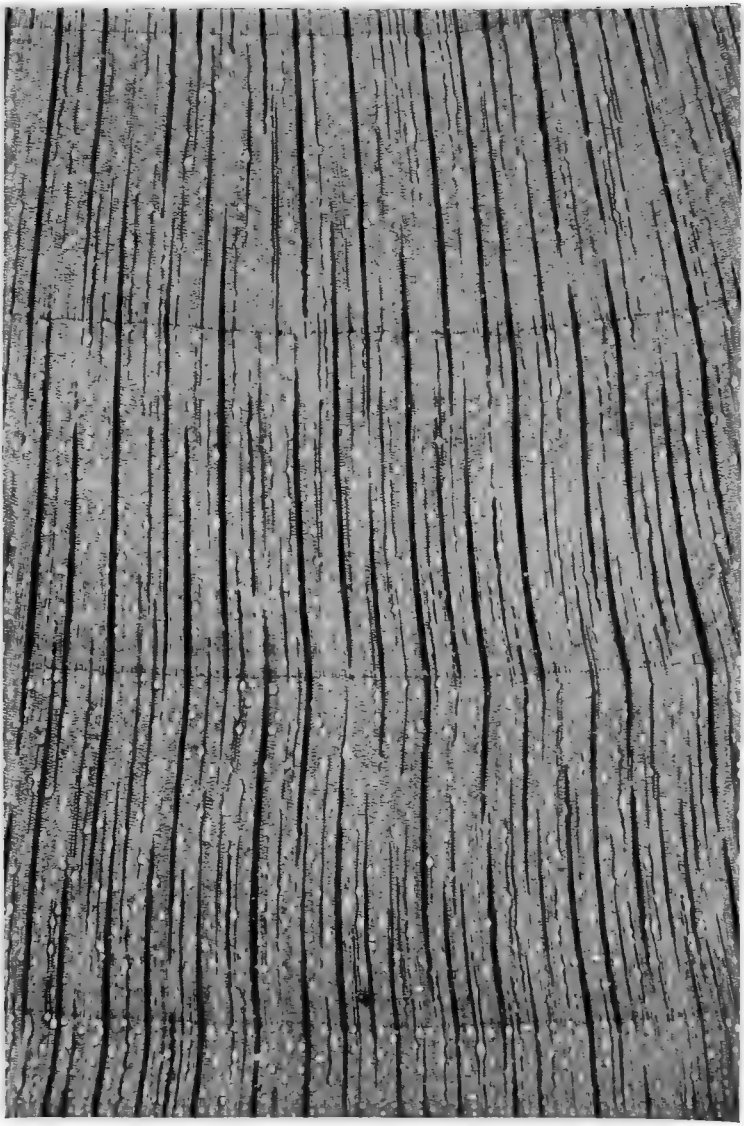


Photo: H. Irving, Horley.

SYCAMORE.



TRANSVERSE SECTION OF SYCAMORE WOOD (X 10 DIAMETERS).

near the fine old castle of Cassilis, one of the seats of the Marquis of Ailsa, on the banks of the River Doon. It was used by the family of Kennedy for the purpose above mentioned."

From its regular form and its summer shade the Sycamore is suitable for planting in the park, or to form a quick-growing screen; and from its rapid but rigid growth it is better adapted to act as a "nurse" to young Oaks, or other valuable timber-trees, than are some other species, because it will not lash the young leaders when blown by wind. The leaves, however, are so infested with "honey-dew" as to render the Sycamore somewhat unsuitable to the lawn. Like that of all the Maple tribe, its sap is rich in sugar, which has in fact been fermented into a wine; and this sugary sap is excreted not only as honey in the flowers, but also by the aphides which feed upon the leaves, when it is known as "honey-dew."

Sir Thomas Dick Lauder truly observes that "the spring tints of the Sycamore are rich, tender, glowing and harmonious; in summer its deep green hue accords well with its grand and massive form, and the brown and dingy reds of its autumnal tints harmonise well with the mixed grove, to which they give a fine depth of tone." To this panegyric, Mr. Selby, the author of the beautiful "History of British Forest Trees," adds:—"The colour of the bark is also agreeable to the eye, being of a fine ash grey, frequently broken into patches of different hues, by the peeling off, in old trees, of large flakes of the outer bark in the manner of the Plane. . . . Vying in point of magnitude with the Oak, the Ash, and other trees of the

first rank, it presents a grand, unbroken mass of foliage, contrasting well, in appropriate situations, and when judiciously grouped, with trees of a lighter and more airy character, and affording, as Gilpin expresses it, 'an impenetrable shade.'" It must be admitted, however, that the diversifying of the bark with lighter patches here alluded to is not nearly so uniformly characteristic of the Sycamore as of the Plane; so that, though a type of sturdy self-reliance in its massive form, the former species cannot, on the score of colouring, be acquited of the charge of monotony.